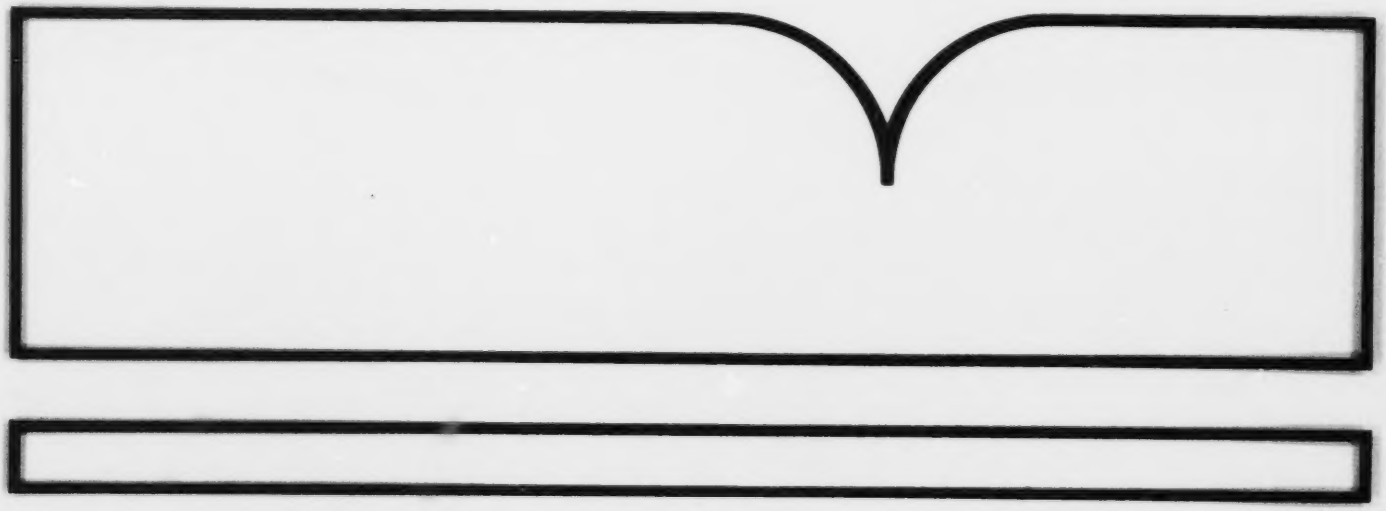
PB88-106513

Superfund Record of Decision (EPA Region 6)
Hardage/Criner, McClain County, Oklahoma
November 1986. First Remedial Action

(U.S.) Environmental Protection Agency
Washington, DC

14 Nov 86



U.S. Department of Commerce
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Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R06-87/017
November 1986

PB88-106513

EPA

Superfund Record of Decision:

Hardage/Criner, OK

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
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SUMMARY OF REMEDIAL ALTERNATIVES SELECTION

FOR SOURCE CONTROL

HARDAGE/CRINER SUPERFUND SITE

MCCLAIN COUNTY, OKLAHOMA

NOVEMBER 14, 1986

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA/ROD/R06-87/017		PB88 106513/AS

4. TITLE AND SUBTITLE	5. REPORT DATE
SUPERFUND RECORD OF DECISION Hardage/Criner, OK First Remedial Action	November 14, 1986 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO
9. PERFORMING ORGANIZATION NAME AND ADDRESS Same as box 2.	10. PROGRAM ELEMENT NO 11. CONTRACT/GRANT NO
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460	13. TYPE OF REPORT AND PERIOD COVERED Final ROD Report 14. SPONSORING AGENCY CODE 800/00

15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Hardage/Criner site is located in McClain County, Oklahoma, approximately 15 miles southwest of Norman, Oklahoma. The area is agricultural with land on all sides of the site used for grazing cattle. From September 1972 to November 1980, the site was operated by the Royal Hardage Industrial - Hazardous Wasteland and Disposal Facility and was permitted to accept all types of industrial and hazardous wastes except radioactive materials. The types of waste included: oil, recycling wastes, chlorinated solvents, styrene tars, acids, caustics, paint sludges, lead, chromium, cyanide, arsenic, pesticides, inks, PCBs, and large quantities of unknown wastes from injection wells and other facilities including what became the Brio and Bioecology Superfund sites. Originally, two pits were excavated; liquids and sludges from drums and tank trucks were discharged directly into these unlined pits. However, both pits filled to capacity. Wastes from the pits were transferred to temporary ponds and then piled on a sludge mound. A total of 18 to 20 million gallons of waste was disposed at the site. In 1978, the State of Oklahoma filed complaints against the facility for suspected lead poisoning of air around the site. In September 1979, the Oklahoma State Department of Health (OSDH) began proceedings to revoke the facility permit for operating unpermitted pits, failure to seal permeable lenses in the pits, improper closure of pits, failure to retain runoff and improper storage of wastes. Site operations ceased in November 1980.
(See Attached Sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Hardage/Criner, OK First Remedial Action Contaminated Media: gw, soil Key contaminants: chlorinated solvents; chromium; inorganics; lead; organics; PCBs; VOCs; toxaphene		

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EPA/ROD/R06-87/017
Hardage/Criner, OK
First Remedial Action

16. ABSTRACT (continued)

Royal Hardage undertook site decontamination and closure efforts which extended into 1982. These efforts included; mixing pit fluids with soil; excavating visibly contaminated soils from mixing areas and temporary ponds; capping the source areas with a soil cover; and consolidating wastes in the source areas. The primary contaminants of concern to the soil and ground water include: chlorinated solvents (1,2-dichloroethane; 1,1,2-trichloroethane; 1,1-dichloroethene, tetrachloroethene and trichloroethene), lead, chromium, PCBs and toxaphene.

The selected remedial action includes: excavation of approximately 180,000 cubic yards from the principal source areas (the drum mound, main pit, and sludge mound) to bedrock and separation of wastes; treatment and disposal of solids in an onsite RCRA-constructed and operated landfill cell; in incineration of organic liquids; treatment and disposal of inorganic liquids; and, temporarily close areas of residual contamination at former source areas until remedial action is selected under the second operable unit. The estimated capital cost is $68,014,000 with present worth O&M costs of $2,282,000.

RECORD OF DECISION

(ENFORCEMENT DECISION DOCUMENT)

Site

Hardage/Criner located in McClain County, Oklahoma

Documents Reviewed

I am basing my decision on the following documents which describe the cost-effectiveness of source control remedial alternatives for the Hardage/Criner Site:

- Field Investigation and Data Summary Report, Royal Hardage Industrial-Hazardous Waste Site near Criner, Oklahoma, by CH_2M Hill, dated May 1984.
- Source Control Feasibility Study, Royal Hardage Industrial Hazardous Waste Site near Criner, Oklahoma, by CH_2M Hill, dated February 1985.
- Preliminary Public Health Assessment for Groundwater Ingestion for the Hardage/Criner site by CH_2M Hill, dated August 1985.
- Summary of Remedial Alternative Selection, November 1986.
- Data gathered prior to and during enforcement actions in 1982 as described in Appendix A to the Summary of Remedial Alternatives.
- August 1986 memo, Bill Langley to Bob Davis describing review and confirmation of 1984 data from sludge mound sampling.
- Public comments received March 10 - April 15, 1986 on the Source Control Feasibility Study.
- Community Relations Responsiveness Summary, November 1986.
- Staff summaries and recommendations.
- Reference materials for the documents listed above.

Description Of Recommended Final Source Control Remedy

Excavate the principal source areas (drum mound, main pit, and sludge mound) to bedrock and separate wastes for treatment as follows:

- Solids - treatment and disposal in an on-site landfill cell constructed and operated in compliance with the Resource Conservation and Recovery Act of 1976, as amended (RCRA).

° Organic liquids will be incinerated.

° Inorganic liquids will te treated and disposed by other means, as appropriate.

Temporarily close areas of residual contamination at the former source areas until remedial action is selected under the second operable unit.

Decision

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the National Oil and Hazardous Substances Contingency Plan (40 CFR Part 300), I select the remedy described above (alternative number seven from the Source Control Feasibility Study) for the Hardage/Criner site. I have determined that this remedy is cost-effective and is protective of public health and welfare and the environment. The action will require operation and maintenance to maintain the effectiveness of the remedy. Since wastes will be left on-site, the remedial action will be reviewed every five years to assure that the remedy is still protecting public health and the environment. The State of Oklahoma has been consulted on the remedy. I have considered Section 121 of the Superfund Amendments and Reauthorization Act of 1986 (SARA), including the cleanup standards thereof, and certify that the portion of the remedial action covered by this Record of Decision (ROD) complies to the maximum extent practicable with Section 121 of CERCLA (as amended by Section 121 of SARA).

If negotiations are successful, potentially responsible parties (PRPs) will enter into a Consent Decree with EPA authorizing the PRPs to implement the remedial action. In the event that negotiations are unsuccessful, on-going litigation will be pursued by EPA and the Department of Justice in an effort to secure performance of the remedial actions.

11/14/86
Date

Frances E. Phillips
Acting Regional Administrator

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
HARDAGE/CRINER
MCCLAIN COUNTY, OKLAHOMA

1.0 Site Location and Description

2.0 Operating History

3.0 Current Site Status

4.0 Risk to Public Health and Welfare and the Environment

5.0 Alternative Development and Screening

6.0 Selected Alternative

7.0 Compliance of Remedial Action with Applicable or Relevant and Appropriate Requirements

8.0 Operation and Maintenance of the Remedy

9.0 Compliance of Source Control Remedy with Section 121 of the Superfund Amendments and Reauthorization Act of 1986 (SARA) to the Maximum Extent Practicable

10.0 Other Operable Units

11.0 Enforcement

12.0 Community Involvement

13.0 References

APPENDICES:

A) Chronology of EPA Site Investigations Prior to 1984

B) List of Potentially Responsible Parties Identified for the Hardage/Criner Site

C) Community Relations Responsiveness Summary on the Source Control Feasibility Study

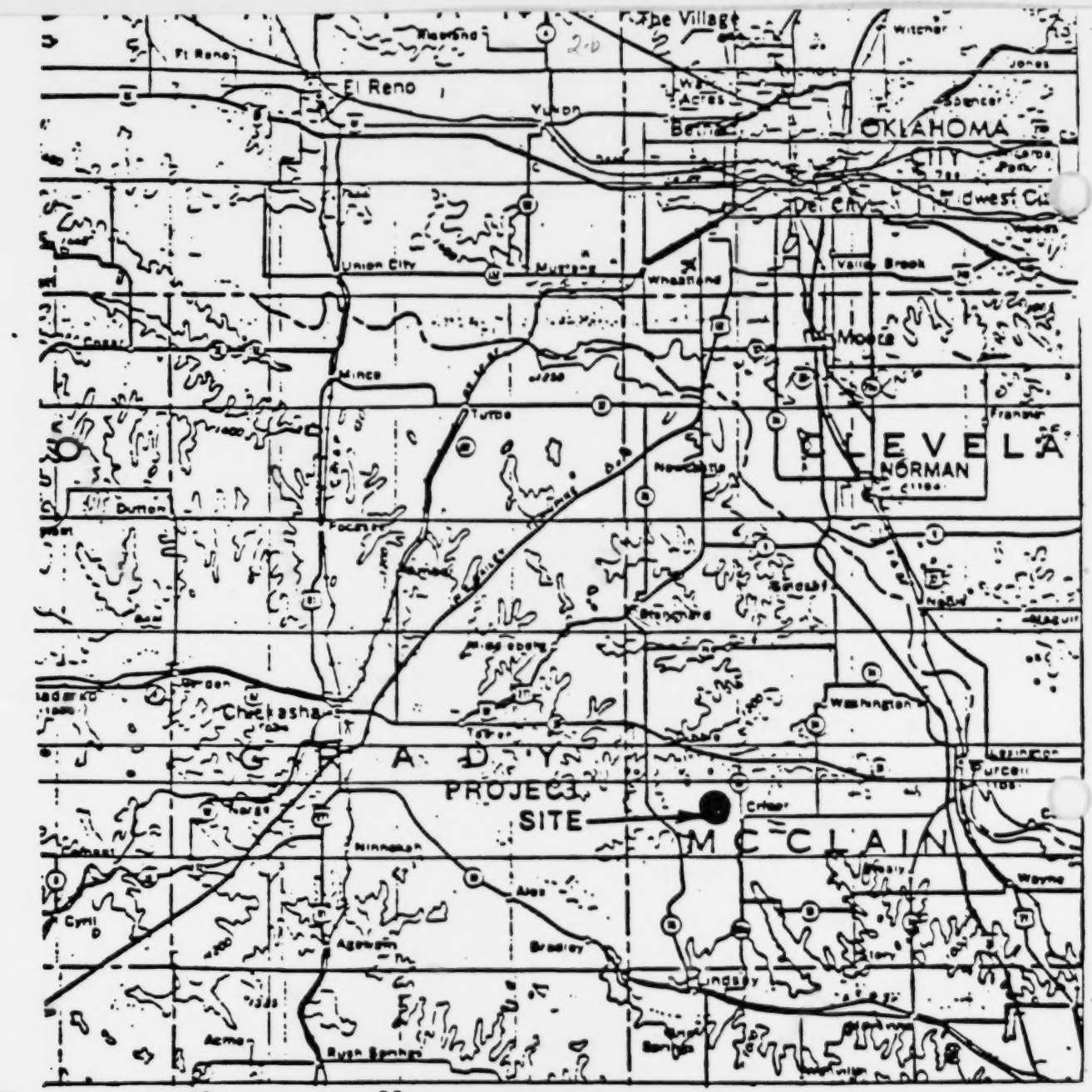


FIGURE 1:

Site location map

(Hardage/Criner ROD 11/86

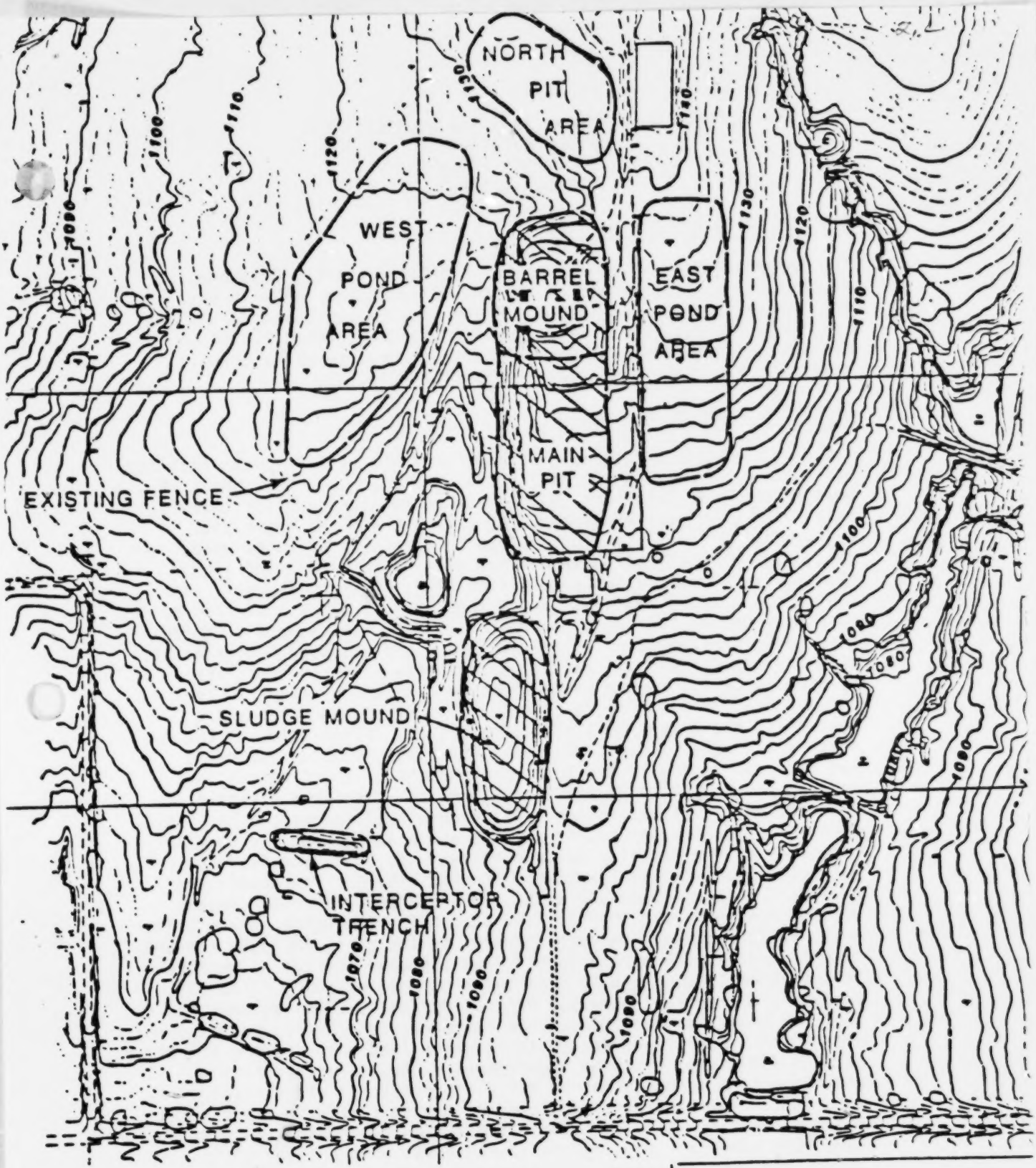


FIGURE 2:

Site topographic map

(Hardage/Criner ROD 11/86)

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
HARDAGE/CRINER
MCCLAIN COUNTY, OKLAHOMA
NOVEMBER - 1986

1.0) SITE LOCATION AND DESCRIPTION

The Hardage/Criner site is located in McClain County, Oklahoma, roughly 15 miles southwest of Norman, Oklahoma and 1/2 mile east of the community of Criner (Fig. 1). The area is agricultural with land on all sides of the site used for grazing cattle. Oklahoma Highway 24 forms the southern boundary of the site and a gravel road runs along the east side of the site (Fig. 2).

2.0) OPERATING HISTORY

The Royal Hardage Industrial - Hazardous Waste Land Disposal Facility was issued an operating permit by the Oklahoma State Department of Health (OSDH) in September 1972 and commenced construction immediately. Two pits were excavated, the main pit and the south pit. Originally, liquids and sludges from drums and tank trucks were discharged directly to these unlined pits. The methods of liquid disposal were evaporation and infiltration; however, the main pit filled to capacity rapidly. Waste from the pit was transferred to temporary ponds, the "west pond" area, where liquids were slurried with soil, transfered on to the south pit and disposed concurrently with styrene tar and oil recycling residues. The south pit was eventually filled in and waste piled to a height of about 10 feet above grade, forming the "sludge mound". After the first years operation, drums were no longer emptied, but rather piled at the north end of the main pit beginning the "drum mound". The mound was extended southward and built to a height of about thirty feet. In all, roughly 18 to 20 million gallons of waste were disposed at the site during its operation. The sequence of operations has been compiled from OSDH inspection reports and a deposition and hearing testimony of the facility owner/operator. In 1978, the State of Oklahoma filed complaints against the facility for suspected lead poisoning of air around the site. In September 1979, OSDH began proceedings to revoke the facility permit for operating unpermitted pits, failure to seal permeable lenses in the pits, improper closure of pits, failure to retain runoff, and improper storage of wastes. In September 1980, the U.S. Department of Justice (DOJ) filed suit on behalf of the Environmental Protection Agency (EPA) against the facility under Section 7003 of the Resource Conservation and Recovery Act (RCRA). Operations ceased in November 1980 prior to the effective date of RCRA interim status requirements. Royal Hardage then undertook site decontamination and closure efforts which extended into 1982. These efforts consisted of mixing fluids in the pits with soil, excavating visibly contaminated soils from mixing areas and temporary ponds and capping the source areas with a layer of soil. During closure, an effort was made to consolidate wastes in the source areas (sludge mound, main pit, and drum mound).

3.0) CURRENT SITE STATUS:

3.1) Site Investigations:

The site was inspected frequently by OSDH during its operation. Inspectors reported widely varying conditions, with problems initially centered around pits filled to capacity and the potential for overflow. In 1976 OSDH requested that Hardage installed groundwater monitoring wells in the southwest drainage. Eventually, thirteen monitoring wells were installed by the operator. These have been periodically sampled ever since, showing uniformly high levels of contamination. Some Hardage wells may have become contaminated by surface runoff entering the well bore during and immediately after construction. However, repeated purging of these wells has not lowered the levels of contaminants.

EPA first inspected the site in July 1979 due to asbestos disposal. EPA contractor Ecology & Environment (FIT) collected samples at the site in August 1979, August and October 1980, and in March and August 1982. In 1984, work was begun by EPA contractor CH_2M Hill to gather supplemental data to allow preparation of a Feasibility Study (FS) for permanent remedial actions on the site. This supplemental data was compiled and field work was documented in a Data Summary Report (DSR) completed in May 1985. A chronology of EPA sampling efforts prior to 1984 is given Appendix in A.

3.2) Contaminants:

The site was permitted to accept all types of industrial and hazardous wastes except radioactive materials (OSDH-1972). A total 18 to 20 million gallons of waste was logged into the site. The resulting mixture contains virtually every type of waste produced by industries operating in the States of Oklahoma and Texas from 1972 through 1980. The general types of waste accepted at the site included: oil recycling wastes, chlorinated solvents, styrene tars, acids, caustics, paint sludges, lead, chromium, cyanide, arsenic, pesticides, inks, PCBs, and large quantities of waste of unknown content from injection wells and other facilities including what became the Brio and Bio Ecology Superfund sites (Hardage 1972-1980, Eltex 1985). Under each of these broad waste types are numerous specific wastes streams produced from perhaps hundreds of different industrial processes, each waste having it's own unique characteristics, impurities, and inherent hazardous and toxic properties.

Some of the contaminants which pose an immediate threat through groundwater are chlorinated solvents, including: 1,2-dichloroethane, 1,1,2-trichloroethane, 1,1-dichloroethene, tetrachloroethene, and trichloroethene (CH_2M Hill 1986a). Other compounds such as lead, chromium, PCB, and toxaphene are present on the site and will pose long term or permanent hazards due to their persistence in the environment. This is by no means an exhaustive list of either the wastes sent to the site or the contaminants of concern; further information is contained in the source control FS.

3.3) Remaining Features:

Source areas include the main pit, drum mound, and sludge mound (Figure 2). The slude mound covers 1.5 acres to a thickness of from 15 to 20 feet above and within the former south pit.

The main pit covers about two acres with a 15 to 20 foot thickness of waste having been slurried with soil and backfilled into the pit, bringing it to the grade of surrounding land on the east and forming a steep berm 10 to 20 feet high on the west. A high concentration of drums is located along the west side of the pit and in the barrel mound which covers about 0.8 acres to a thickness of 30 to 40 feet. Estimates of the number of unemptied drums remaining in the source areas ranges from 10,000 to over 20,000, with knowledge of site operations and history favoring the latter (Hardage 1972-80).

Other areas of the site were used as temporary holding and mixing ponds or may have been incidentally contaminated during site operations. These areas are the west ponds, east ponds, north pit, and the southwest drainage (Figure 2).

Two buildings are still on-site. A former sludge drying building used during the last year of operations is located northeast of the drum mound. A barn, used as the office, is between the sludge mound and main pit.

3.4) Hydrology:

North Criner Creek runs in a northwest to southeast direction south of the site with the alluvial valley extending nearly to the southwest corner of the site. This stream is perennial and joins Criner Creek roughly one mile south of the site. Criner Creek empties into the Washita River thirteen miles south of the site.

A stream runs along the east side of the site, about 400 feet east of the waste areas. This stream has been impounded to form a chain of three small lakes totalling about 6 acres. Another two acre pond lies about 1500 feet west of the drum mound.

3.5) Geology:

The site lies in what are commonly referred to as "redbed" sediments. This is a thick sequence of shales, mudstone, and sandstones which grade back and forth over the space of tens to hundreds of feet. The geology was originally described as consisting of the Bison shale overlying the Purcell sandstone. Site investigations indicated these units are not differentiated at the site; so shallow bedrock is referred to collectively as the Hennesey formation (CH_2M Hill 1985).

Beds generally dip to the south and southwest at less than 5°. No major faults are believed to underlie the site. However, a well defined regional joint system is present with joint sets observed at N 20° W, N 20° E, and N 50° W (Kent 1982).

The alluvium of North Criner Creek is 40 to 60 feet deep at mid valley and made up of decomposed bedrock from adjacent uplands.

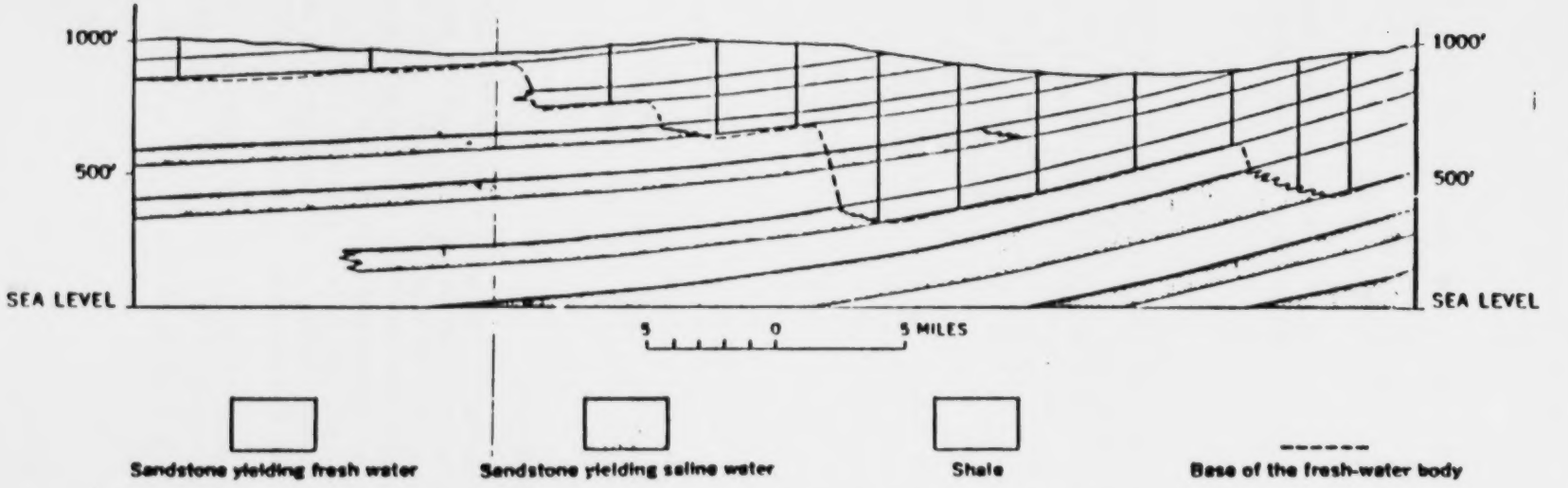
3.6) Geohydrology:

The groundwater table beneath the site generally follows topography and flows are to the southwest and east. Adjacent monitoring wells completed at different depths strongly indicate a vertical (downward) flow component exists. Shales and mudstones underlying the site are fractured and provide a secondary permeability which, coupled with horizontal sandstone beds, has allowed migration of leachate from 400 to as much 2000 feet laterally through the bedrock and over 50 feet beneath the bedrock surface. Questions exist on the method of transport to the southwest, where waste has migrated over 2000 feet by unconfirmed pathways to enter the alluvium of North Criner Creek and apparently form a plume over 1000 feet long in the alluvial aquifer. Further evidence of the bedrock's inadequacy as a barrier to migration is provided by consideration of contamination in two of the CH_2M Hill - 1984 wells (BW-4, GTW-3) and in a series of four FIT - 1982 wells (EW-3,EW-5,EW-6, and EW-7) located to the east and southeast of the sludge mound. These wells are in areas where no site operations occurred and where runoff would not be channeled by topography. The observed 400 feet of migration into these wells over the twelve years between 1984 and 1972 indicates a rate of transport greater than 33 feet per year.

3.7) Areal Groundwater Supplies:

Where possible, residents of the area have drilled water supply wells into the shallow alluvium of streams such as North Criner Creek. However, farms not located in alluvial valleys and without access to these supplies can and have drilled producing wells into the Hennesey formation within one mile of the site. Although not formally classified, both the Criner and North Criner Creek alluvial aquifers and the Hennesey formation would generally be categorized as Class IIb under the EPA Groundwater Protection Strategy.

Fresh water in this area is generally contained in the upper sediments, with water becoming progressively more salty or brackish with depth as indicated in Figure 3 (USGS -1966).



DIAGRAMMATIC SECTION SHOWING BASE OF THE FRESH-WATER BODY IN GENTLY DIPPING SANDSTONE BEDS

FIGURE 3:

Regional hydrogeology
(US - 1966)

3.8) Extent of Contamination:

Groundwater has been contaminated beneath and adjacent to the source areas, in the southwestern drainage, and to the east and southeast of the source areas to depths greater than 50 feet. The alluvium of North Criner Creek has been contaminated, as evidenced by the presence of from 100 to 300 ppb of volatile organic chemicals in three separate wells, which indicates a plume over 1000 feet long (Figure 4). The relative contribution of surface and subsurface pathways to alluvial contamination is unknown. However, transport rates observed on other parts of the site indicate the source areas will, over time, continue or begin to introduce contaminants to the alluvial aquifer through surface and subsurface migration routes.

Soils may be contaminated over several tens of acres as a result of indiscriminant operations and closure. Evidence of this is provided by both visible surface contamination and stressed vegatation. Determination of the extent of surface contamination will require a significant sampling effort during the second unit RI to adequately define the areas requiring remedial measures.

4.0) RISK TO PUBLIC HEALTH AND WELFARE AND THE ENVIRONMENT

Many of the compounds present at the Hardage site are either known or suspected carcinogens. Other compounds either are or are believed to be acutely toxic or capable of causing damage to specific organs. Some of these compounds also bio-accumulate in plant, animal, and human tissues.

The principal routes of exposure for humans are: Groundwater ingestion, direct contact, ingestion resulting from contamination of the food chain and possibly exposure to airborne contaminants.

The alluvial aquifer of North Criner Creek represents the most readily available source of drinking water in the vicinity of the site. This aquifer is contaminated with varying amounts of several chlorinated solvents, as evidenced by sampling of water from the abandoned Corley well and three alluvial monitoring wells. Since several of the compounds detected in these samples are either known or suspected of inducing cancer and/or damage to specific organs of the body, chronic consumption of this groundwater would pose unacceptable health risks.

The Smith and Atkinson/Bearden wells are located 200 and 700 feet respectively from contaminated monitoring wells. Domestic use of water from the abandoned Corley well or the EPA monitoring well AW-S03 would pose lifetime cancer risks in excess of 10^{-4}. Use of groundwater from on-site would pose an excess lifetime cancer risk averaging 2% and up to 60% (CH_2M Hill, 1986a).

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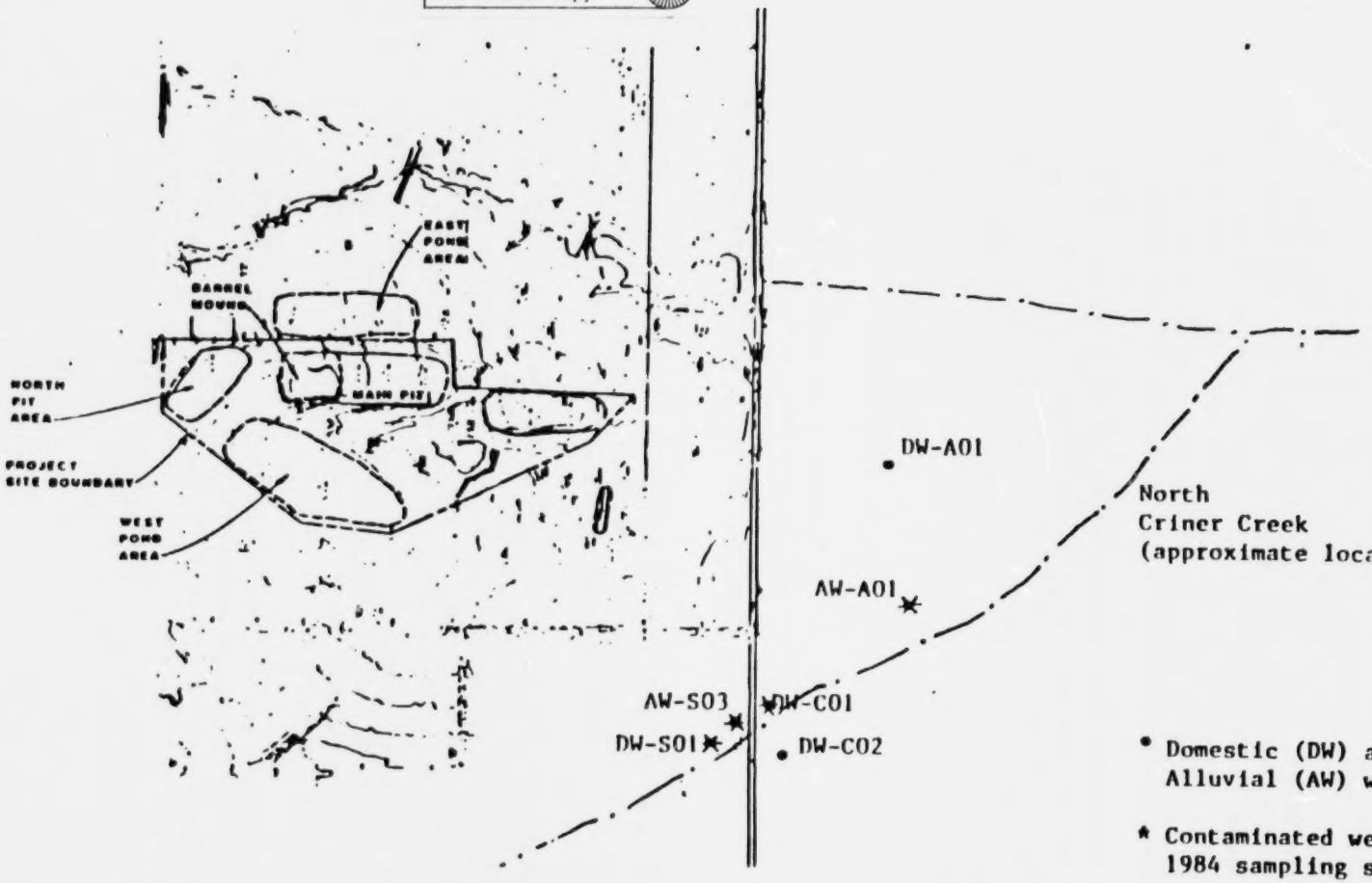

VOLATILE ORGANICS (ppb)	C01	A01	S03	S01
1,1-dichloroethane	29	14	20	ND
1,1- dichloroethene	120	82	60	14
tetrachloroethene	6.6	5.5	<4	ND
1,2-trans-dichloroethene	79	<	41	ND
trichloroethene	9.2	ND	<3	ND
1,1,1-trichloroethane	63	6.1	30	<
1,1,2-trichloroethane	11	<	5	ND

< less than detection limit
ND not detected

FIGURE 4:

Contamination observed in off-site alluvial aquifer of North Criner Creek

Direct contact with wastes on the surface of the site also poses hazards; however, the health risk has not been quantified. Determination of acceptable levels of surface contamination will be a primary concern in the second unit FS. Current human traffic on the site is minimal; but cattle do occasionally graze on the site. Contamination of the food-chain by lead, chromium, pesticides, and PCBs, on the surface of the site poses long-term hazards. This concern has prompted construction of a fence to keep cattle off of the source areas; however, there is evidence of continued intrusion by cattle, giving rise to concerns of food chain contamination. Certain compounds such as pesticides and PCBs have the ability to bioconcentrate through successively higher levels of the food chain (EPA 1985a).

Inhalation of volatiles and contaminated airborne particulates on and possibly adjacent to the site may also pose long term hazards; however, this has not been confirmed.

5.0) ALTERNATIVE DEVELOPMENT AND SCREENING

In accordance with Section 300.68(f) of the NCP and EPA guidance documents (EPA 1985b), several alternatives were developed for source control remedial actions at the Hardage/Criner site. Scoping of general alternatives and objectives for remedial action was first discussed in a 1983 meeting between EPA, OSDH, and EPA contractors. After reconsidering these objectives and alternatives in light of the decision to proceed with a source control operable unit, eleven alternatives were developed (Table 1), as documented in the FS. Of these alternatives, four were retained after screening and developed in further detail (see Section 5.2-5.5 below). Estimated cost ranges for the four alternatives retained are shown in Figure 5.

5.1) Alternatives eliminated in screening:

The most notable result of alternative screening was the elimination of those plans for containing the wastes in place. Several methods of isolating the wastes and reducing or eliminating their release were considered. After screening of technologies, several in-situ containment plans were developed. Of these, capping in conjunction with vertical trenches to intercept shallow groundwater (Alternative #5) would be expected to be the most effective. While this plan may be the most effective in-situ containment plan, it can by no means be considered as an adequate remedy on that basis alone. Consideration of this alternative did, however, serve as a test of whether or not any form of capping-in-place remedy would sufficiently contain the source areas. Technologies such as slurry walls and groundwater injection/withdrawl were eliminated due to the presence of fractured bedrock, observed vertical migration of contaminants, and the absence of any continuous horizontal bedrock layer at

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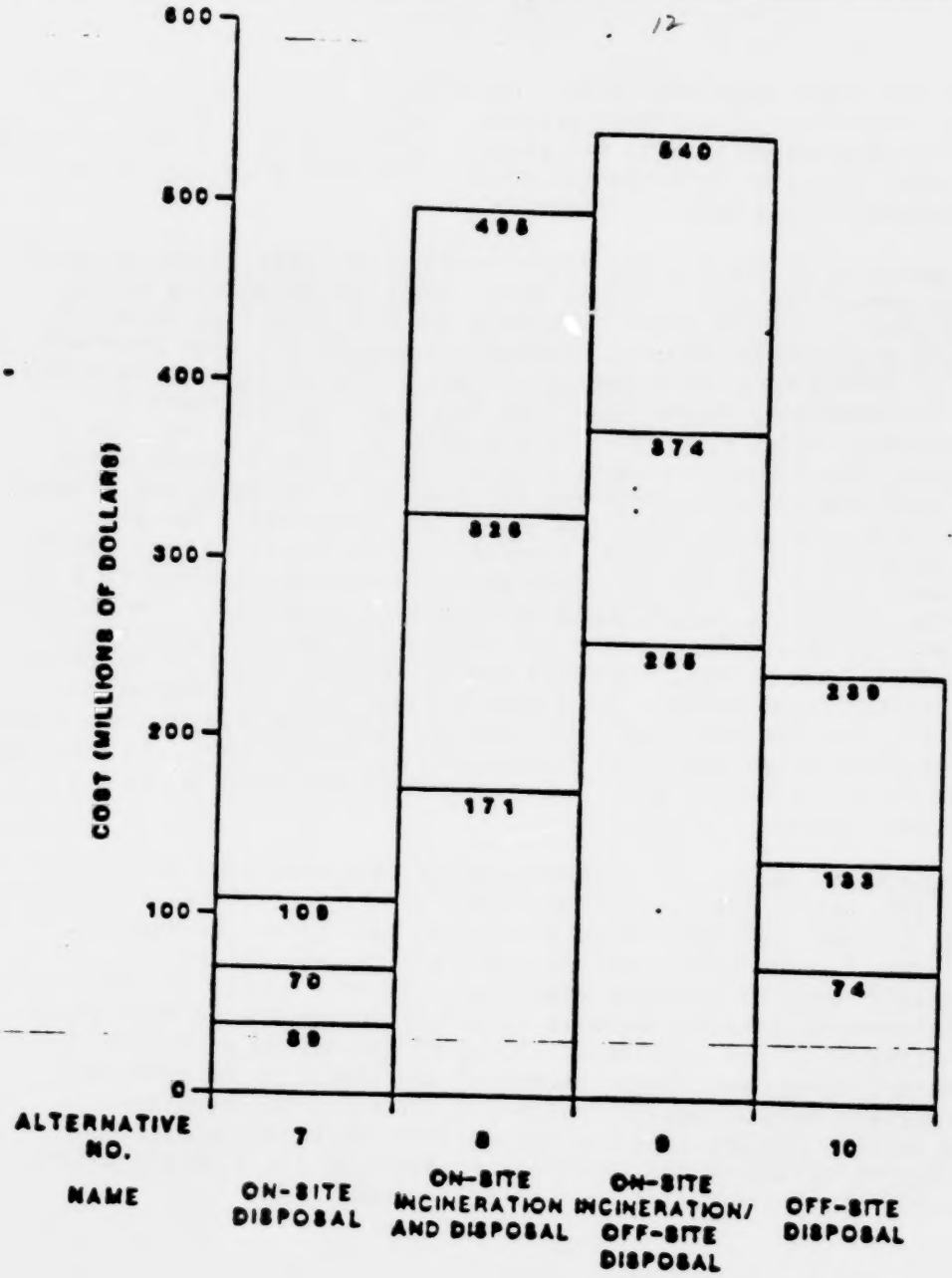
TABLE 1 - Source Control Remedial Alternatives

- Alternative No. 1 - No Action: no site remedial action taken.
- Alternative No. 2 - Limited Action: remedial action consists of grading, revegetation, fencing and institutional restrictions for the site.
- Alternative No. 3 - Capping: both source areas would be left in place and covered with a multi-layered cap.
- Alternative No. 4 - Upgradient Drains: the source areas would be left in place, covered with a multi-layer cap and upgradient groundwater drains constructed.
- Alternative No. 5 - Perimeter Drains: source areas would be left in place, covered with a multi-layer cap and upgradient and downgradient groundwater drains constructed.
- Alternative No. 6 - Partial Removal: a cap and perimeter drains would be constructed around the sludge mound, the main pit and barrel mound would be excavated, the wastes treated, as needed, and disposed of in an on-site compliant RCRA landfill.
- Alternative No. 7 - On-site Disposal: both source areas would be excavated, the wastes treated, as needed, and disposed of in an on-site RCRA compliant landfill.
- Alternative No. 8 - On-site Incineration and Disposal: both source areas would be excavated, the wastes incinerated on-site and disposed of in an on-site RCRA compliant landfill.
- Alternative No. 9 - On-site Incineration/Off-site Disposal: source areas would be excavated, the wastes incinerated on site and disposed of in an off-site RCRA compliant landfill.
- Alternative No. 10 - Off-site Disposal: both source areas would be excavated, the wastes treated on-site to meet landfill criteria and transported to an off-site RCRA compliant landfill.
- Alternative No. 11 - Off-site Incineration: both source areas would be excavated and the majority of the wastes transported to an off-site incinerator for incineration and disposal.

* Off-site incineration was assumed in some cases for cost-estimating purposes. This does not reflect a final decision to use off-site disposal facilities for any waste from the Hardage site.



UPPER NUMBER REPRESENTS UPPER-BOUND CONDITION,
MIDDLE NUMBER REPRESENTS BASE CONDITION,
LOWER NUMBER REPRESENTS LOWER-BOUND CONDITION.

FIGURE 5:

Costs and sensitivity ranges for source control remedial alternatives

(Hardage/Criner ROD 11/86)

reasonable depth with sufficient integrity to provide a natural base to any engineered containment system. Further discussion of these capping-in-place or in-situ containment technologies and the rationale for their rejection is presented in both the Source Control FS and the Responsiveness Summary (Appendix C).

Consideration of the cap and drain alternative revealed the presence of the same flaws as existed in other plans for containing wastes. The drains were first considered to a depth of five feet below the present groundwater surface. However, migration has been observed to over thirty feet below the water table, indicating that interception substantially deeper than five feet would be necessary to provide meaningful reductions in the releases now occuring. In addition, free liquids present in the landfill and in drums which will continue to deteriorate and burst would be released and allowed to migrate vertically until the source was exhausted. The plan involving shallow (five foot) trenches was estimated to cost $35-40 million. Extensive and continous operation and maintanence (O & M) for the indefinite future would be necessary to maintain the collection system. It was estimated that for collection rates greater than 0.5 gallons per minute, economics would indicate construction of an on-site treatment plant. The problems associated with operating such a system for the indefinite future, meeting discharge requirements and handling occasional peak flows could be significant. In addition, there is no method for assuring the longterm operation of such a treatment system.

The continued release of hazardous wastes and hazardous substances with only negligible lateral interception and no vertical interception, the need for indefinite O & M when such cannot be assured, the potential for continued off-site impacts, and the entire "band-aid" type of approach that this, the most viable in-situ containment alternative entails is wholly inadequate to meet the objective of CERCLA and the directive of the NCP to provide a permanent remedy meeting or exceeding applicable or relevant and appropriate Federal public health and environmental requiremnts. As a result, closure in place was rejected as being incapable of containing wastes in the immediate vicinity of the site and unacceptable as a permanent source control remedy.

5.2) Alternative 7 - On Site Disposal:

The source areas (drum mound, main pit, and sludge mound) would be excavated. Solids would be treated and disposed in a landfill cell constructed on-site. Liquids would generally be incinerated. After completion, the landfill would be closed with a multi-layer cap and gas venting system. The Remedial Action (RA) would require about 18 months to complete at a present worth cost of $70 million (Table 2).

TABLE 2:

ALTERNATIVE NO. 7--ON-SITE DISPOSAL

ITEM	COST
GENERAL	$ 1,800,000
EXCAVATION, SEPARATION, SAMPLING	$12,979,000
TREAT AND TRANSPORT DRUMMED WASTES	$ 5,450,000
ON-SITE DISPOSAL	$12,789,000
SITE RESTORATION	$ 196,000
EVAPORATION/COLLECTION POND FOR SURFACE WATER	$ 280,000
SURFACE WATER TRANSPORTATION, TREATMENT AND DISPOSAL	$ 5,403,000
OTHER PROVISIONS	$ 249,000
Construction Subtotal	$39,146,000
Bid Contingencies (15%)	$ 5,872,000
Scope Contingencies (20%)	$ 7,829,000
Construction Total	$52,847,000
Permitting and Legal (7%)	$ 3,699,000
Services During Construction (10%)	$ 5,285,000
Total Implementation Costs	$61,831,000
Engineering Design Costs (10%)	$ 6,183,000
TOTAL CAPITAL COSTS	$68,014,000
OPERATION AND MAINTENANCE (Present Worth)	$ 1,690,000
Bid Contingencies for Operation and Maintenance (15%)	$ 254,000
Scope Contingencies for Operation and Maintenance (20%)	$ 338,000
TOTAL OPERATION AND MAINTENANCE (PRESENT WORTH)	$ 2,282,000
TOTAL PRESENT WORTH	$70,296,000

* Off-site incineration was assumed for cost-estimating purposes. This does not reflect a final decision to use off-site disposal facilities for any waste from the Hardage site.

5.3) Alternative 8 - On Site Incineration and Disposal:

The source areas would be excavated. Wastes would be incinerated in a kiln constructed on-site. Ash would still contain metals and, until proven otherwise through de-listing, would require disposal as a hazardous waste. Disposal would be in a landfill cell constructed on-site. This alternative would require four to eight years to implement at an estimated present worth cost of $326 million (Table 3).

5.4) Alternative 9 - On Site Incineration and Off Site Disposal:

The source areas would be excavated and wastes incinerated as above. The difference between this and Alternative 8 would be the off-site disposal of incinerator ash. This alternative would require four to eight years to implement at a cost of $374 million (Table 4). Future O & M for this source control remedy would be non-existent.

5.5) Alternative 10 - Off Site Disposal:

The source areas would be excavated; and wastes would be transported off-site to existing Treatment Storage and Disposal (TSD) facilities for landfilling, incineration, reuse/recycling, or other treatment as appropriate. This alternative could be implemented in about 2 years at an estimated present worth cost of $133 million (Table 5). As with alternative 9, O & M would be non-existent.

6.0) SELECTED ALTERNATIVE:

Alternative 7 (On-Site Disposal) is selected as the appropriate remedy for source control at the Hardage/Criner site. The process by which this alternative was chosen over the other three under consideration is outlined below.

6.1) Remedial alternative selection procedure:

EPA is required by Section 300.68(i) of the NCP to determine the appropriate extent of remedy by, "Selection of a cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment". The NCP goes on to state that the selected remedy will attain or exceed applicable or relevant and appropriate Federal environmental and public health requirements. EPA has considered the cost, technology, reliability, administrative and other concerns in selecting Alternative 7 as the appropriate remedy, as documented below. These considerations have only been applied to alternatives meeting or exceeding the above noted requirements.

TABLE 3:

ALTERNATIVE NO. 8--ON-SITE INCINERATION AND DISPOSAL

ITEM	COST
GENERAL	$ 7,352,000
EXCAVATION, SEPARATION, SAMPLING	$ 12,979,000
ON-SITE INCINERATION OF WASTE FILL	$130,500,000
TREAT AND TRANSPORT DRUMMED WASTES	$ 2,916,000
ON-SITE DISPOSAL	$ 10,175,000
SITE RESTORATION	$ 196,000
EVAPORATION/COLLECTION POND FOR SURFACE WATER	$ 310,000
SURFACE WATER TRANSPORTATION, TREATMENT AND DISPOSAL	$ 21,611,000
OTHER PROVISIONS	$ 249,000
Construction Subtotal	$186,288,000
Bid Contingencies (15%)	$ 27,943,000
Scope Contingencies (20%)	$ 37,258,000
Construction Total	$251,489,000
Permitting and Legal (7%)	$ 17,604,000
Services During Construction (10%)	$ 25,149,000
Total Implementation Costs	$294,242,000
Engineering Design Costs (10%)	$ 29,424,000
TOTAL CAPITAL COSTS	$323,666,000
OPERATION AND MAINTENANCE (Present Worth)	$ 1,384,000
Bid Contingencies for Operation and Maintenance (15%)	$ 208,000
Scope Contingencies for Operation and Maintenance (20%)	$ 277,000
TOTAL OPERATION AND MAINTENANCE COSTS (PRESENT WORTH)	$ 1,869,000
TOTAL PRESENT WORTH	$325,535,000

* Off-site incineration was assumed for cost-estimating purposes. This does not reflect a final decision to use off-site disposal facilities for any waste from the Hardage site.

TABLE 4:

ALTERNATIVE NO. 9--ON-SITE INCINERATION/OFF-SITE DISPOSA

ITEM	COST
GENERAL	$ 7,928,000
EXCAVATION, SEPARATION, SAMPLING	$ 12,979,000
ON-SITE INCINERATION OF WASTE FILL-- Design, Construction and Operation	$130,500,000
TREAT AND TRANSPORT DRUMMED WASTES	$ 3,788,000
WASTE FILL REMOVAL TO OFF-SITE LANDFILL	$ 16,958,000
OFF-SITE LANDFILL DISPOSAL CHARGES	$ 20,850,000
SITE RESTORATION	$ 196,000
EVAPORATION/COLLECTION POND FOR SURFACE WATER	$ 310,000
SURFACE WATER TRANSPORTATION, TREATMENT AND DISPOSAL	$ 21,611,000
Construction Subtotal	$215,120,000
Bid Contingencies (15%)	$ 32,268,000
Scope Contingencies (20%)	$ 43,024,000
Construction Total	$290,412,000
Permitting and Legal (7%)	$ 20,329,000
Services During Construction (10%)	$ 29,041,000
Total Implementation Costs	$339,782,000
Engineering Design Costs (10%)	$ 33,978,000
TOTAL CAPITAL COSTS	$373,760,000
OPERATION AND MAINTENANCE (Present Worth)	$0
Bid Contingencies for Operation and Maintenance (15%)	$0
Scope Contingencies for Operation and Maintenance (20%)	$0
TOTAL OPERATION AND MAINTENANCE COSTS (PRESENT WORTH)	$0
TOTAL PRESENT WORTH	$373,760,000

TABLE 5:

ALTERNATIVE NO. 10--OFF-SITE DISPOSAL

ITEM	COST
GENERAL	$ 2,538,000
EXCAVATION, SEPARATION, SAMPLING	$ 12,979,000
TREAT AND TRANSPORT DRUMMED WASTES	$ 7,584,000
WASTE FILL REMOVAL TO OFF-SITE LANDFILL	$ 21,228,000
OFF-SITE LANDFILL DISPOSAL CHARGES	$ 26,100,000
SITE RESTORATION	$ 196,000
EVAPORATION/COLLECTION POND FOR SURFACE WATER	$ 280,000
SURFACE WATER TRANSPORTATION, TREATMENT AND DISPOSAL	$ 5,403,000
Construction Subtotal	$ 76,308,000
Bid Contingencies (15%)	$ 11,446,000
Scope Contingencies (20%)	$ 15,262,000
Construction Total	$103,016,000
Permitting and Legal (7%)	$ 7,211,000
Services During Construction (10%)	$ 10,302,000
Total Implementation Costs	$120,529,000
Engineering Design Costs (10%)	$ 12,053,000
TOTAL CAPITAL COSTS	$132,582,000
OPERATION AND MAINTENANCE (Present Worth)	$0
Bid Contingencies for Operation and Maintenance (15%)	$0
Scope Contingencies for Operation and Maintenance (20%)	$0
TOTAL OPERATION AND MAINTENANCE COSTS (PRESENT WORTH)	$0
TOTAL PRESENT WORTH	$132,582,000

6.1.1) Comparison of on-site versus off-site remedial action alternatives:

Two alternatives, 7 and 8, involve on-site disposal of wastes excavated from source areas. Alternatives 9 and 10 entail complete off-site disposal of wastes. The alternatives 7 and 10 involve essentially the same operations (i.e. excavation with limited incineration and landfilling for the bulk of wastes), except that they are on and off-site variations of basically the same alternative. Similarly, alternatives 8 and 9 are basically on and off-site disposal options for residue from the on-site incinerator. Based on this point, the analysis below compares on-site to off-site disposal.

Cost: The cost of off-site landfilling and incineration alternatives exceed their on-site counterparts by 90% ($63 million) and 15% ($48 million) respectively.

Technology: The on and off-site options will be virtually identical in the treatment and disposal technologies employed. Control of the quality of work done under the on-site alternatives may be somewhat superior in this respect however, since these actions would be conducted under EPA oversight and off-site treatment or disposal would not.

Reliability: The off-site disposal options will provide reliability in preventing releases from this site, simply because wastes would not remain on-site. However, off-site disposal has the potential to increase health risks at other sites. It is not certain that any significant advantage exists in reliability of off-site over on-site disposal locations. The Hardage/Criner facility is in compliance with the siting requirements currently governing location of commercial disposal facilities. For this reason, any particular vulnerabilities which are present on the Hardage site would not necessarily be absent at off-site facilities.

Administrative: Each alternative will comply with RCRA Part 264 requirements, long-term objectives of CERCLA as amended, and all applicable or relevant and appropriate requirements for protection of public health and welfare and the environment. Since wastes will be left on-site, the remedial action will be reviewed every five years after it's completion, as required by the Superfund Amendments and Reauthorization Act of 1986 (SARA), to assure that the remedy is still protecting public health and the environment.

Other concerns: (Safety during implementation) Both on and off-site alternatives carry inherent risks during excavation. As discussed later, these impacts can be controlled. The primary difference between the on and off-site alternatives with respect to safety during implementation is the potential for accidents

or spills during off-site transport of the wastes. For example, an estimated 11,000 loads would be required to transport the entire 180,000 cubic yards of waste off-site. For the 400 to 800 mile transport distance assumed in the FS, trucks carrying waste from the Hardage site would be on the road from four to eight million miles.

Consideration of the components of the four remedial action alternatives evaluated shows that the key difference is the presence of an on-site landfill under the two on-site alternatives. Information collected to date indicates that an adequate landfill cell could be constructed on-site and successfully maintained. The site meets RCRA Section 264.18 siting requirements for seismic stability and flooding potential. Due to the hazards and costs arising from off-site disposal and transport, clear and significant benefits should be present before off-site disposal is selected. Those benefits are not significant or certain in this case. While such benefits may exist in the off-site treatment of small to moderate quantities of specific wastes, organic liquids may be an example, off-site disposal for the entire waste quantity is not preferred over on-site management of wastes in this case. Therefore, the off-site alternatives are eliminated from consideration, and the on-site disposal alternatives (7 - On-site disposal; 8 - On-site incineration and disposal) will be carried on for further evaluation.

6.1.2) Comparison of the two on-site alternatives:

Cost: Alternative 7 would cost $39-109 million to implement, with the most likely cost being $70 million. Alternative 8 would cost $171-495 million, the likely figure being $326 million. Therefore, the benefits to be derived from incineration of all waste would come at a cost of 470% ($256 million) greater than landfilling.

Technology: Incineration is a key component of both alternatives 7 and 8. Since some wastes are liquids which cannot be landfilled, the decision to incinerate organic liquids is appropriate.

Incineration of all wastes will have the net benefit of destroying virtually all organic materials. Even with incineration however, heavy metals will still be present in the residue. These materials simply cannot be destroyed. The mobility can be reduced by treating the waste to reduce it's acidity; this would be done under either alternative.

Reliability: By incineration, virtually all organics are destroyed, leaving an ash with varying contents of heavy metals requiring stabilization and disposal as a "characteristic" hazardous waste. The landfilling alternative, with limited incineration, removes only the free organic liquids with the greatest potential for penetrating a landfill liner and moving into the environment.

Landfilling and incineration of liquids are established technologies, with a demonstrated ability to perform under similar conditions. Incineration of soils contaminated by a heterogenous mixture of wastes, while feasible, has not yet been attempted on a scale such as would be required for complete incineration at the Hardage site.

Administrative: Both alternatives would meet all aplicable or relevant and appropriate requirements for protection of public health and welfare and the environment. Since wastes would be left on-site, the remedial actions would have to be reviewed every five years as required under Section 121 of SARA.

Other concerns: (time to implement) Landfilling can be accomplished in 12 to 18 months. Incineration will take four to eight years.

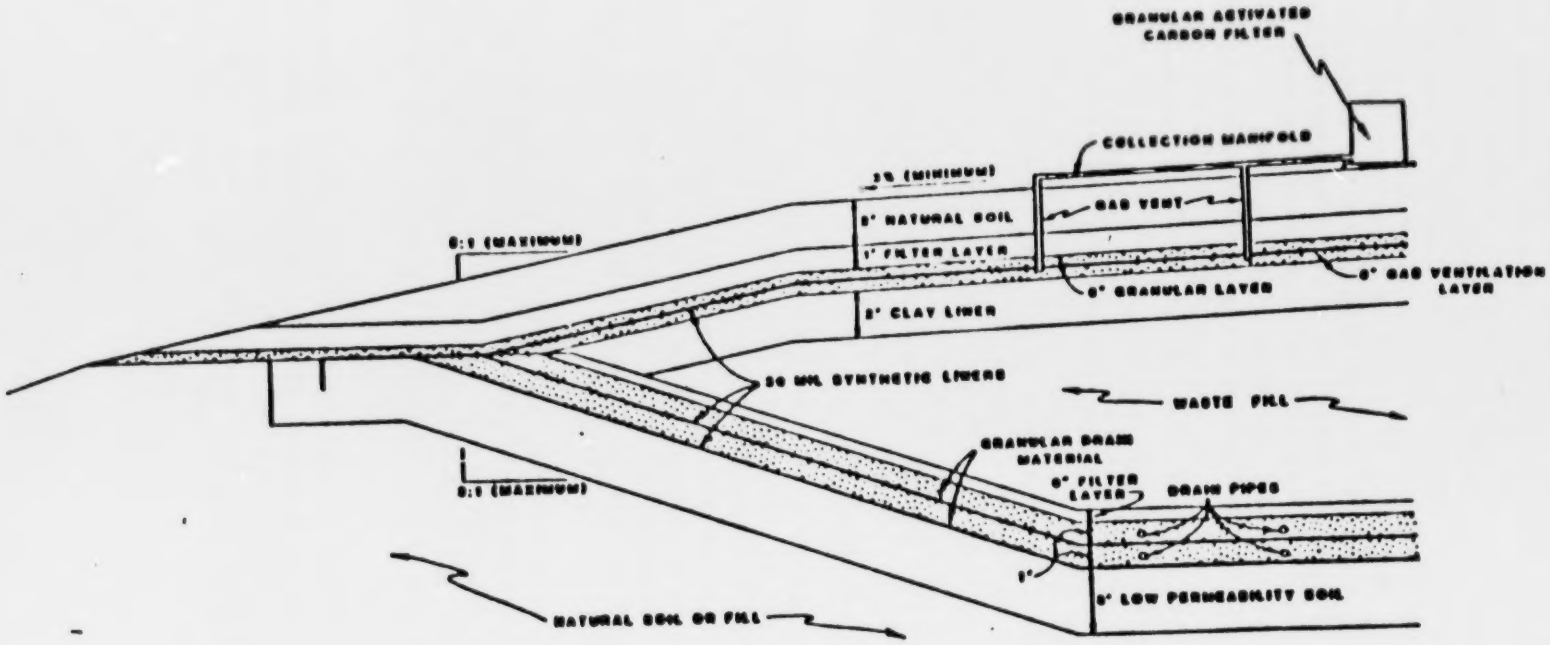
Based on the factors considered above, Alternative 7 (On-site landfill with liquids incineration) is selected as the appropriate remedy for the Hardage/Criner site. This alternative will provide a degree of protection to public health and welfare and the environment similar to that which could be achieved with complete incineration. This remedy can also be carried out in a shorter time using proven technologies which are currently in wide-spread application.

6.2) Detailed Description of the Recommended Alternative:

The following is a general sequence of operations and construction activities required to implement on-site disposal for a source control remedy at the Hardage/Criner site. The timing and specifications will be developed in detail during the Remedial Design (RD) phase of response.

A landfill cell will be constructed to meet the minimum technology requirements for hazardous waste landfills as set forth in RCRA Section 264.301. The key feature of such a landfill cell is a double liner system with interior leachate monitoring and collection (Figure 6). The landfill will be constructed above grade on the high ground west and north of the present source areas, as indicated in the FS. If at all possible, construction of the landfill cell over significant residual contamination will be avoided. The exact siting of the landfill cell will be based on the results of surface soil sampling during the second unit RI, consideration of topography and hydrology of the site, and possibly additional geotechnical data collected during the RD. Sufficient land is available on which to site a landfill cell.

The sludge mound, main pit, and drum mound will be excavated. This represents a volume of approximately 180,000 cubic yards, and includes in excess of 10,000 to 20,000 unemptied drums. For this operable unit, the vertical extent of waste excavation will be to the upper surface of undisturbed bedrock (see Section 6.3 - Clean-up levels).



NOT TO SCALE

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FIGURE 6:

Typical cross-section of on-site landfill

After waste excavation, treatment, and disposal (described below), the empty waste pits and bedrock now underlying the waste piles will still remain. This upper bedrock surface is believed to be saturated with waste seepage to an unknown depth. Such residual contamination will generally not be removed during the source control remedial action, since the appropriate extent of vertical excavation cannot yet be defined. In order to prevent contamination of surface runoff waters and to eliminate direct contact exposure hazards from open areas of residual waste, it will be necessary to construct a protective temporary cap over the former source areas. This temporary cap will serve the dual purposes of preventing direct rainfall from leaching the contaminated bedrock and eliminating direct contact hazards. The cap will be constructed so as to achieve these goals and at the same time be of a design to allow upgrading to meet relevant and appropriate RCRA closure standards should it be determined by the second operable unit RI/FS that closure in-place is an appropriate permanent remedy for residual contamination beneath the former source areas. Considering the relative times required for design of the source control remedy and conduct of the management of migration RI/FS, it is possible that final clean-up levels will have been developed for the site prior to waste excavation. If such clean-up levels are available, the interim cap would be unnecessary and remedial action for residual contamination in the bedrock beneath the former source areas can proceed directly from excavation of the source areas.

Since wastes excavated in the source areas will range in consistency from dry solids to relatively pure liquids, and since the appropriate means of waste treatment and disposal is in large part determined by the physical consistency of the material, it is clear that criteria will have to be developed during the RD which allow segregation of: liquids for incineration or other treatment, solids whose moisture content is appropriate for landfilling, and solids requiring moisture reduction prior to landfilling.

Liquids will be defined by the relevant and appropriate RCRA testing procedures (currently the Paint Filter Test) which are effective at the time the remedial design is approved. Liquds will be segregated based on their chemical make-up (i.e. organic versus inorganic as described in the FS). The RD will develop criteria for making this distinction.

Solids, as defined by testing procedures noted in the above paragraph, will be handled in a manner based on decisions made in a moisture content evaluation, described below under Section 6.2.3. Based on the criteria developed there, wastes will have to have to fall below an upper limit on moisture content, after treatment, before they can

disposal bans, do not preclude their placement in the landfill. Based on the determinations and criteria from the RD, the wastes will be treated and disposed as indicated in the general schematic shown in Figure 7. Discussion of waste treatment and disposal is provided below.

Treatment of organic liquids: These liquids will be incinerated. Based on the economics of the volume of materials encountered, this would be done either at an off-site facility or on-site with a portable or modular incinerator.

Treatment of inorganic liquids: Based on the economics of the volume and character of the liquids encountered, treatment and disposal may be done either on or off-site. On site treatment would generally be through physiochemical methods capable of removing both organics and metals, to allow discharge under an NPDES permit or transport to a publicly owned treatment works. If off-site treatment is selected, either deep well injection or treatment at a commercial facility would be available.

Treatment of Solids: Solids will ultimately be placed in the landfill cell constructed on-site. Prior to disposal, the wastes will be subjected to treatment aimed at reducing their toxicity and mobility. Since a large volume of contaminated soil is present, significant volume reduction would not be possible. Such treatment may include addition of materials to stabilize the fill or physiochemical treatment designed to remove or alter specific hazardous constituents or classes of compounds. Treatment technologies identified are:

- chemical neutralization (pH adjustment),
- solidification by addition of lime, cement, fly ash, or other proprietary agents,
- reduction of liquid content,
- chemical oxidation or reduction, and
- air stripping to remove volatiles.

Other alternative treatment technologies identified during the remedial design will also be considered for application, and those technologies showing promise for the specific wastes and situations at the Hardage site will be evaluated further through bench tests or pilot studies as appropriate

During the remedial design, an evaluation including bench testing will be conducted to determine an appropriate upper limit on the moisture content of fill which could be placed in the on-site landfill. This evaluation will consider the potential composition of pore fluids in the waste, the reaction of various soil/fluid combinations under the type of triaxial stresses to be expected within the

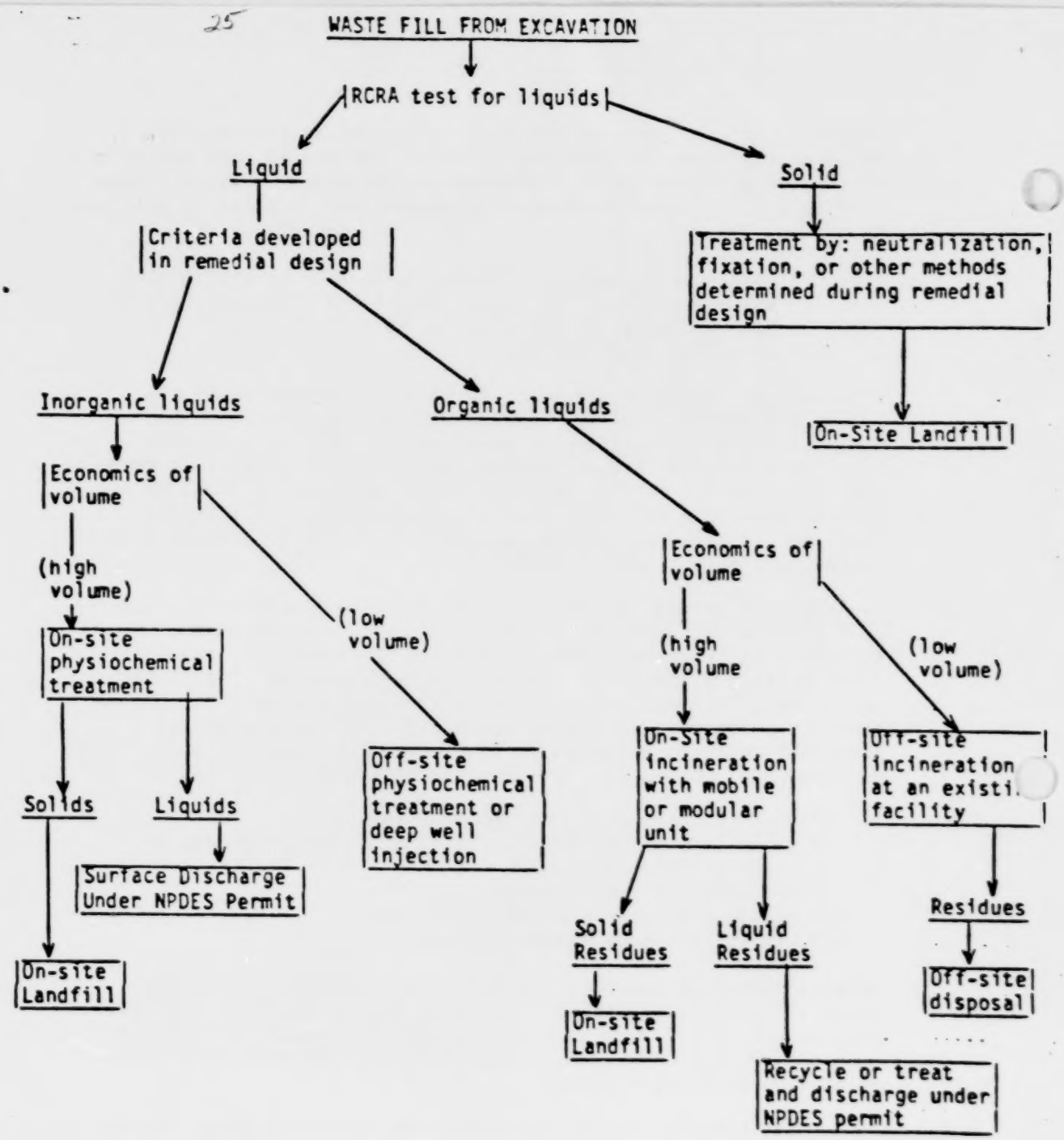

FIGURE 7:

Treatment schematic for alternative number 7 - on-site landfill wit liquids incinerator

(Hardage/Criner ROD 11/R

landfill, the potential for long and short-term leachate generation, and the effects of such leachate on various liner systems proposed for the landfill cell. Based on the results of this evaluation, an upper limit will be imposed on the moisture content of wastes which can be disposed in the landfill. Wastes placed in the landfill will in no case be of the type which:

a) would be classified as "liquids" by applicable or relevant and appropriate testing procedures pursuant to the RCRA prohibition on the disposal of liquids in landfills; or

b) are the subject of any land disposal bans under the Hazardous and Solid Waste Amendments to RCRA or the Toxic Substances Control Act which are determined to be applicable or relevant and appropriate.

Treatment technologies will be further refined during the RD phase; and additional design data may be required. The variability of wastes present in the source areas precludes any extensive characterization of wastes prior to excavation. For this reason, final determinations on appropriate treatment will in some cases have to be made during the RA itself.

6.3) Clean-up Levels for the Source Control Operable Unit:

Selection of clean-up levels will be a concern of the second operable unit (Management of Migration). Ultimately, clean-up levels will have to be selected for the base of the pits and for surface soils on-site. In the pit areas, the criteria will generally include potential for migration of metals and organics which have already migrated out of the pits. The surface soil criteria will focus on metals, PCBs, and pesticides due to their persistence in the environment, direct contact exposure hazards, and potential to contaminate surface runoff.

The Source Control operable unit deals exclusively with the concentrated pits and piles of wastes. In this case, selections of compounds of concern and selection of clean-up levels based on soil concentrations of these compounds is not appropriate. The criteria to be used for determining the extent of clean-up will be the surface of undisturbed bedrock. If, at that point in the RA, additional data from the second operable unit RI/FS or the Source Control RD has allowed determination of a final clean-up level, then excavation, in-situ treatment, or permanent capping may be implemented for the residual contaminants. If such data is not available, a temporary cap will be installed over the excavated areas pending second operable unit remedy determination.

6.4) Health and Safety Concerns During Implementation

Excavation of the waste piles and pits will pose hazards to workers via air and direct contact in addition to the physical hazards normally associated with such construction. In many cases the waste excavation and handling will have to be conducted under Level B protection (containerized air and protective clothing) to mimize hazards to the workers. Air release of volatile organics will likely increase during waste excavation. Continuous monitoring of air around working areas, at the site perimeter, and near offsite homes will allow identification of health threats to off-site residents and prevent problems from going undetected. Dust and vapor suppression measures, maintenance of a small working face of exposed waste, and possible use of a temporary structure over the excavation will help to minimize air releases.

Runoff retention structures and emergency holding ponds will be used to prevent chronic or sudden releases during construction.

7.0) COMPLIANCE OF REMEDIAL ACTION WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR PROTECTION OF PUBLIC HEALTH AND THE ENVIRONMENT

Section 300.68(i) of the NCP directs that EPA will, except in narrow cases such as "fund-balancing", select a remedy that "attains or exceeds applicable or relevant and appropriate Federal public health and environmental requirements that have been identified for the specific site." These applicable or relevant and appropriate requirements (hereinafter "Requirements") are discussed in an October 2, 1985 memorandum from Winston Porter, Assistant Administrator for EPA's Office of Solid Waste and Emergency Response, "CERCLA Compliance with Other Environmental Statutes", which is set forth in the preamble to the NCP at 50 Fed. Reg. 47912, 47946 (November 20, 1985).

The principal requirements and policies to be considered during conduct of the RA will be as follows:

7.1) RCRA Subtitle C Permit Requirements, 40 CFR Part 264:

While not deemed applicable to the site since it closed prior to November 19, 1980, these requirements are considered to be relevant and appropriate to this CERCLA response action to the extent indicated below. Leaving engineering considerations aside, the Part 264 permit requirements are considered appropriate rather than the Part 265 interim status requirements. The facility closed prior to the effective date of interim status, rather than attempt to comply with these standards. Royal Hardage notified EPA of hazardous waste activity under RCRA in August 1980, but withdrew the notification in November 1980 and did not file Part A of the RCRA permit application, most likely because the site could not have met those

standards without bankrupting the facility. As indicated previously, wastes were disposed haphazardly in unlined pits and the treatment, storage, and disposal of hazardous wastes at the facility as far below the standards required for interim status facilities. Indeed, EPA filed a lawsuit seeking clean up and closure of the facility under RCRA, Section 7003 in U.S. District Court in Oklahoma City on September 8, 1980. EPA has conclusive and demonstrable evidence of releases of hazardous wastes and hazardous substances from the disposal units of the Hardage site. Given this situation, the most appropriate Federal environmental requirements to apply to the source control action, which is consistent with and forms a substantial increment of a permanent site remedy, would be the Part 264 requirements, applicable to new facilities, along with their more stringent closure requirements.

Additionally, EPA believes that the physical nature of the site, it's hydrology, and underlying geologic conditions dictate that the waste materials not be left in-place. Accordingly, it is clear that the Part 264 permitting and closure requirements should be applied to the construction and closure of new disposal units necessary for this facility.

Finally, it should be noted that, as the preamble to the NCP states, "... although the Subtitle C regulations differ as to whether a hazardous waste facility has a RCRA permit (40 CFR Part 264) or is operating under interim status (40 CFR Part 265), remedies will generally have to be consistent with the more stringent Part 264 standards, even though a permitted facility is not involved. The Part 264 standards represent the ultimate RCRA compliance standards and are consistent with CERCLA's goals of long term protection of public health and welfare and environment." 50 Fed Reg at 47918.

7.1.1) Subpart B - Siting Requirements:

This will govern placement of the landfill cell on-site. The principal concerns stated in this subpart are seismic stability and flooding potential. Neither factor appears to be a major concern at the Hardage site; therefore, compliance does not seem to pose problems.

7.1.2) Subpart F - Groundwater:

This subpart will determine the extent to which the on-site landfill will be monitored. It will have a much wider application under the second operable unit.

7.1.3) Subpart G - Closure and Post-Closure:

These standards will apply to closure of the landfill cell(s) after completion of the source control RA. The remedy will comply with this subpart.

7.1.4) Subpart K - Surface Impoundments:

This will apply to any temporary impoundments constructed during the RA that treat, store,or dispose hazardous wastes. Impoundments will be lined, operated, closed, and if necessary monitored in compliance with this subpart.

7.1.5) Subpart N - Landfills:

This subpart will govern construction and operation of the landfill cell. The landfill will meet requirements set forth for new landfills.

7.2) Toxic Substances Control Act:

This would come into application if PCBs are encountered at levels greater than 50 ppm, since such materials are banned from land disposal. In that case, alternative treatment would be required and implemented in order to comply with the Act.

7.3) EPA CERCLA Off-Site Policy (memorandum dated May 5, 1985; "Procedures for Planning and Implementing Off-site Response Actions"):

This policy will determine which TSD facilities are eligible for receipt of hazardous substances from the site. The policy generally requires a facility to be permitted and have no significant RCRA violations or conditions affecting it's satisfactory operation. Prior to disposing or authorizing disposal of wastes from this site the Region will contact the State in which the facility is located, review the facility's record of operation, and if appropriate contact other Regional offices of EPA where the facilities may be located to evaluate compliance with this policy. No wastes will be disposed at any site not meeting the criteria set forth in the policy.

7.4) Occupational Safety and Health Standards (29 CFR Part 1910):

These standards will be applied during remedial actions to protect workers from exposure to hazardous substances and other physical hazards associated with implementation of the RA. Methods for assuring the safety of workers involved in the RA will be devloped and described in a "Site Safety Plan" developed as part of the Remedial Design.

7.4) Hazardous and Solid Waste Amendments to RCRA of 1984:

The Hazardous and Solid Waste Amendments to RCRA of November 1984 (HSWA), 42 U.S.C. 6901 et seq. contain provisions setting several statutory dates for banning land disposal of hazardous wastes The provisions discussed here are RCRA Section 3004 (d)(e) and (g), due to the possible intersection of their statutory deadlines with the construction schedule for a source control remedy at the Hardage site.

The HSWA land disposal amendments are in fact not yet applicable or effective Federal requirements with respect to CERCLA Section 104 or 106 response actions, since their implementation dates are still some time off in the future. The bans found in subsection (g) are to be implemented during three periods over 21 months for 1/3, 2/3, and finally all of the RCRA subtitle C "listed" hazardous wastes commencing August 8, 1988, as determined by EPA. Those determinations will be made by rulemaking. See 50 Fed. Reg. 19300 (May 28, 1986) for the list of wastes to be considered.

The statutory ban on the "California List" wastes and solvents in subsections (d) and (e) and the prospective bans laws of subsection (g) are not considered relevant and appropriate at this time, since their applicability to CERCLA waste disposal is in the future. The effect of the bans in subsection (g) on the remedy is speculative at best, since EPA is required to engage in rulemaking for methods of land disposal and pretreatment for such disposal, 42 U.S.C. 6924 (g)(5) and (m). Futhermore, it must be emphasized that CERCLA requires the selection of cost-effective remedies and does not require EPA to implement standards that are not in effect.

During the course of remedial action and construction, EPA intends to further review the effect of land disposal bans on waste disposal at the site and the issues of how such laws will be implemented should they intersect the construction schedule. Additionally, bench tests and/or pilot studies may be performed with respect to pre-treatment methods for solvents and other organics potentially impacted by such bans.

8.0) OPERATION AND MAINTENANCE

The on-site landfill will require little routine operation and maintenance (O & M). Monitoring of the interior leachate detection system will be required, as will periodic inspections of the cap and monitoring of gases leaving the venting system. Development and routine sampling of a groundwater monitoring network will also be necessary for 30 years, at which time the need for additional monitoring will be reevaluated.

To provide a contingency in project cost estimates, it was assumed that at 30 years after construction replacement of the landfill liner and cap might be necessary. The cost is reflected in the present worth cost estimate of $70 million. Operation and maintanence costs on a present worth basis are estimated as $2,282,000 in 1985 dollars.

9.0) COMPLIANCE OF SOURCE CONTROL REMEDIAL ACTION WITH SECTION 121 OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA) TO THE MAXIMUM EXTENT PRACTICABLE

9.1) Basic Certification:

The selected remedy will comply with Section 121 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by SARA, including the cleanup standards thereof, to the maximum extent practicable. The selected remedy is considered to be cost effective and protective of human health and the environment as well, in accordance with the NCP.

9.2) Permanent Solutions and Technologies

In selecting this remedy, EPA has considered a full range of alternatives and solutions and alternative treatment technologies that will result in a permanent and significant decrease in toxicity, mobility, or volume of the hazardous substances present. In conducting its assessments of remedial alternatives and treatment technologies, EPA has considered:

1) The long term uncertainties of land disposal;

2) goals and requirements of the Solid Waste Disposal Act ("RCRA");

3) persistence, toxicity, mobility and bioaccumulation potential of the wastes;

4) short and long term potential for adverse human health effects;

5) long term maintenance costs of the remedy;

6) potential for future remedial actions costs if the remedy fails;

7) potential threat to human health and the environment from the excavation, transportation, and redisposal, or containment of hazardous substances.

9.3) Remedy Analysis:

The selected remedy is a remedy for the first operable unit of remediation - source control. It is a significant part of overall remediation at the Hardage site and is consistent with a permanent remedy for the site. The second operable unit, "management of migration", is now under development.

This remedy will employ treatment through incineration of all free liquid organics in the estimated 175,000 cubic yards of waste fill, as well as the more than 18,000 estimated drums of waste buried on-site. Remaining waste fill and inorganic solid drum contents will be treated through stabilization measures prior to redisposal in a double lined on-site RCRA compliant landfill cell. In carrying out these measures, EPA will be permanently and significantly reducing the volume, toxicity, and mobility of the hazardous substances present at the Hardage site. Further, EPA will avoid in large measure the potential dangers and uncertainties of transport and disposal off-site, with its on-site approach for the bulk of wastes. EPA requires that this source control remedy be reviewed not less than every five years to assure that human health and the environment are being protected.

As noted previously, in Section 7 herein, EPA has scrupulously considered the applicable or relevant and appropriate federal requirements for protection of public health and the environment in accordance with the NCP. EPA has also looked into the issue of applicable or relevant and appropriate state environmental laws and has determined that the "RCRA analogous" regulatory requirements of the Oklahoma Controlled Industrial Waste Disposal Act, as amended, authorized by EPA under RCRA to operate in lieu of the EPA regulations, are met or exceeded by the selected remedy. In a nutshell, EPA has complied with the SARA Section 121 cleanup standards to the maximum extent practicable.

10.0) OTHER OPERABLE UNITS

EPA's response actions on the Hardage/Criner have been divided into two operable units: Source Control (the remedy discussed in this document) and Management of Migration (also referred to as the groundwater/off-site operable unit).

The source control response is limited to the source areas of the site (sludge mound, main pit, and drum mound). The bases of the main pit and southern pit (beneath the sludge mound) at approximate elevations of 1109 and 1093 feet MSL respectively form the lower bound of the source areas. The lateral bounds of the source areas are described by the base of the slopes on the north, south, and west faces of the waste piles and pits, and as the lateral extent of the excavated pits on those sides of the source areas where wastes and cover have been backfilled to ground level.

The management of migration RI/FS will include the following:

- Definition of the extent and levels of contamination present in soils and rock outside the source area;
- determination of the extent and fate of groundwater contamination in the alluvium of North Criner Creek and the feasibility and need for remedial actions in the alluvial valley;

- determination of permanent surface clean-up levels on-site to prevent or minimize further degradation of potential surface and ground water supplies, direct contact hazards to the public, and other long term hazards.

11.0) ENFORCEMENT

11.1) Hardage I:

In 1979, EPA inspections of the site indicated poor waste management practices posing potential threats to public health and welfare and the environment. In September 1980, the U.S. Department of Justice (DOJ) filed a complaint on behalf of EPA in U.S. District Court in Oklahoma City, Oklahoma. The complaint alleged violations of Section 7003 of RCRA and sought proper cleanup and closure of the site. The facility had ceased operations in early November 1980, before RCRA Interim Status Standards came into effect.

In 1982, DOJ and EPA amended the existing complaint against the facility owner and operator Royal Hardage. The complaint was changed to include allegations and requested relief under Sections 106 and 107 of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). In December 1982, the Court found that the site posed an imminent and substantial endangerment to public health and welfare and the environment as defined by CERCLA Section 106 and RCRA Section 7003. In August 1983, the Court granted a partial judgment for over $211,000 in response costs, which EPA had incurred through 1982, against Royal Hardage.

Hardage filed for bankruptcy in 1983 and again in 1985, and EPA has never recovered its partial judgment.

11.2) Hardage II

EPA compiled available records from the sites operations including daily and monthly site logs of wastes received, waste manifests, and disposal plans and records filed with the State of Oklahoma by generators and transporters of waste to the site.

As a result numerous Potentially Responsible Parties (PRPs) were identified. In December 1984, EPA mailed letters to 289 of these PRPs requesting information about their waste disposal at the Hardage site under authority of Section 104(e) of CERCLA and Section 3007 of RCRA and notifying the PRPs of their potential liability for site cleanup. As further information was gained, information request and notice letters were sent to additional PRPs identified. At the present time, over 400 PRPs have been identified. Various PRPs have gone out of business or cannot be located; therefore, approximately 340 have been contacted. A number of these parties, have organized into the Hardage Steering Committee (HSC). The HSC has met with EPA and OSDH on numerous occasions since EPA's first PRP meeting concerning the site in January 1985.

Since the FS was on going at the time the PRPs were notified and CERCLA progam policy previously did not allow PRP conduct of RI/FS studies without a signed agreement to also implement the EPA selected remedy, the PRPs were not involved in preparation of the FS. In May 1985, EPA released the DSR documenting 1984 site investigations; and HSC also obtained all EPA files on the site. The HSC has retained Dames & Moore and more recently ERM-Southwest to provide technical support in their dealings with EPA.

In July 1985 the Court administratively closed the 1980 case against Hardage, providing that the U.S. could re-open the case for the purpose of seeking appropriate relief until April 1, 1986, at which time the case would otherwise be dismissed. DOJ, on behalf of EPA, filed a motion on March 27, 1986, to amend the existing complaint and add generators and transporters to the existing case. The Court ultimately denied the motion and dismissed the case, providing that Royal Hardage could be named for limited purposes in a subsequent case.

On June 25, 1986, DOJ filed a new complaint naming 36 generators and transporters of waste at the site. The complaint asks for performance of the EPA selected source control remedy, maintenance of site security, conduct of a RI/FS for the management of migration operable unit and any subsequent EPA selected remedy, and recovery of EPAs' past and future response costs. A status conference was held on September 3, 1986, and a second status conference has been set for January 7, 1987.

12.0) COMMUNITY INVOLVEMENT

Due to the large number of PRPs for this site, the majority of meetings, comments on the FS, and other external communication has been with these parties, However, attention has been given to the concerns of near site residents and other interested parties.

When the draft FS was completed on February 20, 1986, a press release was issued announcing this fact, copies of the FS were placed in repositories, and a copy was provided directly to the Hardage Steering Committee. The public comment period was from March 10-April 15, 1986. A public meeting was held in Chickasha, Oklahoma to answer questions and receive comments on the FS on March 20. The response to questions, comments, and concerns raised during this period is contained in the Responsiveness Summary, Appendix C.

13.0 REFERENCES

CH_2M Hill 1985
Field Investigation and Data Summary Report, Royal Hardage Industrial Hazardous Waste Site, CH_2M Hill, May 22, 1985

CH_2M Hill 1986a
Preliminary Public Health Assessment, CH_2M Hill, August 1986

CH_2M Hill 1986b
Source Control Feasibility Study, Royal Hardage Industrial Hazardous Waste Site, CH_2M Hill, February 20, 1986

EPA 1985a
Public Health Assessment Manual, EPA - Office of Solid Waste and Emergency Response, November 1985

EPA 1985b
Guidance on Feasibility Studies Under CERCLA, EPA, June 1985

EPA 1986
Superfund Remedial Design and Remedial Action Guidance, EPA, June 1986

Eltex 1985
Letter from Eltex Chemical and Supply (Houston, Texas) to Stephen Phillips (EPA-Dallas), August 1985

Hardage 1972-80
Monthly waste site log of materials received at the Hardage site

Kent 1982
Evaluation of Hydrogeology at Royal Hardage Industrial Waste Site; Criner, Oklahoma, Douglas C. Kent, May 1983

OSDH 1972
Industrial-Hazardous waste landfill permit issued September 12, 1972 to Royal HJartdage by OSDH

USGS 1966
Base of Fresh Groundwater in Southern Oklahoma, D.L. Hart, United States Geological Survey Hydrologic Atlas - 223, 1974

APPENDIX A

CHRONOLOGY OF EPA SITE INVESTIGATIONS PRIOR TO 1984

APPENDIX A

EPA Sampling and Inspections of Hardage/Criner prior to 1984:

June 27, 1979

Inspector:	Ralph Hawkins (EPA-Ada Branch) accompanied by Oklahoma State and County Health Department personnel
Purpose:	NESHAPS inspection due to asbestos disposal
Result:	Recommended Sampling of site
Documentation:	7/3/79 memo, Hawkins to Charles Gazda (EPA-Dallas)

August 15, 1979

Inspector:	S.C. Yin (EPA - Ada Branch) with other EPA and State Health Department personnel
Purpose:	Obtain samples and inspect site
Result:	Nine soil, water, and waste samples taken, analyzed for metals and organics; photos taken
Documentation:	9/10/79 memo, Yin to Charles Gazda (EPA-Dallas) 10/26/79 memo William Langley (EPA-Houston Lab) to Oscar Ramirez (EPA-Dallas) transmitting analytical results.

August 14, 1980

Inspector:	Thomas Smith of Ecology & Environment (FIT) for EPA
Purpose:	Off-Site sampling
Result:	Three samples taken from off-site drainage pathways; analyzed for metals and organis; photos taken
Documentation:	8/21/80 memo T. Smith to Charles Gazda (EPA-Dallas): 9/23/80 memo William Langley (EPA-Houston Lab) to William Librizzi (EPA-Dallas) transmitting analytical results

October 1, 1980

Inspector:	S.C. Yin (EPA-Ada Branch) with FIT personnel
Purpose:	Off-site sampling
Result:	Thirteen (13) samples taken from off-site drainage and domestic water wells, analysis for metals and organics, photos taken

Documentation: 10/23/80 memo, Yin to William Librizzi (EPA-Dallas):
10/15/80 memo William Langley (EPA-Houston Lab) to Librizzi transmitting analytical results

March 23 - April 8, 1982

Inspector: Imre Sekelyhidi (FIT) personnel and other FIT employees for EPA

Purpose: Detailed on and off-site sampling of the site

Result: 3/23-24/82, 29 samples collected;
3/30-4/1/82, 6 domestic wells sampled
3/30-4/2/82, 10 monitoring wells drilled, by Shepard Testing and Engineering Co., Inc. of Norman, Oklahoma at locations directed by Jerry Thornhill (Hydrogeologist, EPA-Ada Branch)
soil borings and monitoring well samples collected from each new monitoring well

August 16, 1982

Inspector: Ecology & Environment (FIT) for EPA

Purpose: Second sampling round for the wells drilled by FIT in March 1982

Result: 10 groundwater samples collected

APPENDIX B

LIST OF POTENTIALLY RESPONSIBLE PARTIES IDENTIFIED FOR THE HARDAGE/CRINER SITE

709 AAR CORP.
710 A BETTER SANITATION
711 ABLE UNIFORM RENTAL
712 ACME FENCE
713 ADVANCE PACKAGING
714 AGLAND, INCORPORATED
715 ALTEC SOUND PRODUCTS DIVISION
716 AMERICAN AIRLINES, INCORPORATED
717 AMERICAN DISPOSAL SERVICE
718 AMERICAN FARM LINES, INCORPORATED
719 AMERICAN FURNITURE STRIPPING
720 AMERICAN TRAILERS, INCORPORATED
721 AMOCO PRODUCTION COMPANY & RESEARCH
722 A-ONE BIT & TOOL COMPANY
723 ATLANTIC RICHFIELD COMPANY
724 ARKANSAS BEST CORPORATION
725 ARROW TANK TRUCK, INCORPORATED
726 ARTHUR G. McGEE AND COMPANY
727 ASHLAND CHEMICAL COMPANY
728 BALON CORPORATION
729 BEAUTY CRAFT TILE OF THE SOUTHWEST, INC.
731 BINNEY I. SMITH, INCORPORATED
732 BOB MOORE OILWELL SERVICE
733 BORDEN CHEMICAL DIVISION
734 BRITTAIN BROTHERS (NAPA)
735 BROADWAY MACHINE & MOTOR SUPPLY
736 BROWN AND ROOT, INCORPORATED
737 BROWNING-FERRIS INDUSTRIES, INCORPORATED
738 B.S. & S. ENGINEERING COMPANY
739 CAPITOL GREASE COMPANY
740 CATO OIL & GREASE
741 C.E. NATCO
742 CHARLES MACHINE WORKS, INCORPORATED
743 CHROM ALLOY DIVISION
744 CHROMIUM PLATING COMPANY
745 CIMARRON MANUFACTURING COMPANY
746 CITIES SERVICE OIL COMPANY
747 CITY SERVICE
748 CITY OF NORMAN
749 CLAYTON PLATING COMPANY
750 CLYDE'S CARBURETOR SERVICE
751 CMI CORPORATION
752 COMPETITION AUTOMOTIVE
753 CONOCO, INCORPORATED
754 CONSOLIDATED CLEANING SERVICE COMPANY
755 CONTAINER CORPORATION OF AMERICA
756 CORE LABORATORIES
757 COUNTY HOME MEAT COMPANY
758 CRANE CARRIER CORPORATION
759 CROSBY GROUP, McKISSICK PRODUCTS DIV.
760 CROWL MACHINE & HEAT TREATING
761 CROWN TRANSPORT COMPANY
762 DAL-WORTH INDUSTRY, INCORPORATED
763 DAYTON TIRE & RUBBER COMPANY
764 DEL PAINT MANUFACTURING
765 DELTA FAUCET COMPANY
766 DELTA TRANSMISSION

THIS LIST REPRESENTS EPA'S PRELIMINARY FINDINGS ON THE IDENTITIES OF POTENTIALLY RESPONSIBLE PARTIES. INCLUSION ON THIS LIST DOES NOT CONSTITUTE A FINAL DETEMINATION CONCERNING THE LIABILITY OF ANY PARTY FOR THE HAZARD OR CONTAMINATION AT THE HARDAGE SITE

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769 DESOTA, INCORPORATED
770 DOUBLE EAGLE REFINING LUBRICANTS, INC.
771 DOVER CORPORATION
772 DOW CHEMICAL COMPANY
773 DOWNTOWN AIRPARK, INCORPORATED
774 DRILLERS ENGINE & SUPPLY
775 DURA-CHROME INDUSTRY
776 EASON & SMITH, WASTE HAULERS
777 EASON ENTERPRISES
778 EASON OIL
779 E.I. DUPONT DE NEMOURS
780 ELTEX CHEMICAL AND SUPPLY COMPANY
781 ENGINEERING ENTERPRISES
782 EQUIPMENT RENEWAL COMPANY
783 ERNEST ST. CLAIR
784 EUREKA TOOL COMPANY
785 EVAN'S ELECTRIC SERVICE CENTER
786 FAA AERONAUTICAL CENTER
787 FIBERCAST CORPORATION
788 FINE CANDY COMPANY
789 FIRST NATIONAL MANAGEMENT CORPORATION
790 FLINT STEEL CORPORATION
791 FORD GLASS PLANT
792 FOSTER FEED & SEED
793 FOSTER SEPTIC TANK CLEANING
794 FRED JONES MANUFACTURING
795 FREUHAUF CORPORATION
796 GARDNER-DENVER COMPANY
797 GENERAL ELECTRIC
798 GENERAL ELECTRIC
799 GENERAL TIRE & RUBBER
800 GEOPHYSICAL RESEARCH
801 GLIDDEN COATINGS & RESINS COMPANY
802 GLOW-LITE DIVISION OF DUTCH BOY, INC.
803 GOODYEAR TIRE & RUBBER COMPANY
804 GOVERNAIR CORPORATION
805 GRDENDYKE TRANSPORT, INCORPORATED
806 HALLIBURTON SERVICES
807 ROYAL M. HARDAGE
808 HART INDUSTRIAL DISPOSAL
809 HATHAWAY INDUSTRIES
810 HELM & WEAVER
811 HERMETIC SWITCH, INCORPORATED
812 HOLLEY CARBURETOR
813 INDUSTRIAL UNIFORM
814 INDUSTRIAL DISPOSAL SUPPLY, INCORPORATED
815 INTERNATIONAL CRYSTAL MANUFACTURING
816 JOHN ZINK COMPANY
817 JONES-BLAIR PAINT COMPANY
818 KELSEY-HAYES
819 KELTRONICS CORPORATION
820 KERR McGEE, PRESIDENT
821 KIMBALL CHEMICAL COMPANY
822 KOBE, INCORPORATED
823 KOCO-TV
824 LAWTON PLATING COMPANY
825 LEAR SIEGLER, INCORPORATED

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826 L. & S. BEARING COMPANY
827 LEEWAY MOTOR FREIGHT(C.L. MOTOR FREIGHT)
828 MAREMONT CORPORATION
830 MASTER MOTORS
831 MATERIALS RECOVERY ENTERPRISES
832 McDONNELL DOUGLAS
833 McKESSON CHEMICAL COMPANY
834 MANUFACTURING MERCURY MARINE
835 METROPLEX SANITATION
836 MIKE MONRONEY AERONAUTICAL
837 MOBIL CHEMICAL COMPANY
838 NAMEPLATES, INCORPORATED
839 NATIONAL CAN CORPORATION
840 NATIONAL PACKAGING COMPANY
841 NELSON ELECTRIC COMPANY
842 NEWSPAPER PRINTING CORPORATION
843 NICKLES MACHINE CORPORATION
844 NORDHAM, INCORPORATED
845 NORTHROP WORLDWIDE AIRCRAFT SERVICE INC.
846 NU CHROME PLATING
847 O'BRIEN PAINT CORPORATION
848 OCCIDENTAL CHEMICAL
849 OKLAHOMA CITY DISPOSAL
850 OKLAHOMA GAS & ELECTRIC
851 OKLAHOMA CITY COUNTY HEALTH DEPARTMENT
852 OKLAHOMA DEPARTMENT OF AGRICULTURE
853 OKLAHOMA DEPARTMENT OF CORRECTION
854 OKLAHOMA STATE DEPARTMENT OF HEALTH
855 O.K. PUBLISHING COMPANY
856 OKLAHOMA MACHINE MANUFACTURING
857 O.K. NATIONAL STOCKYARDS COMPANY
858 O.K. NATURAL GAS COMPANY
859 O.K. TANK SERVICE, INCORPORATED
860 O.K. TRANSPORTATION COMPANY
861 ORAL ROBERTS UNIVERSITY
862 PAGE INDUSTRIES
863 PATTERSON SARGENT
864 PHARMASEAL LABS
865 PHILLIPS CHEMICAL
866 PHILLIPS PETROLEUM
867 POWELL SANITATION SERVICE
868 POWELL SERVICE COMPANY
869 PRESBYTERIAN HOSPITAL
870 PRESTOLITE CORPORATION
871 PRYOR FOUNDRY, INCORPORATED
872 PUBLIC SERVICE COMPANY
873 RA MAJ CIRCUITS, INCORPORATED
874 RANDY ALLIO
875 REAGENT CHEMICAL & RESEARCH, INC.
876 RED BALL MOTOR FREIGHT
877 ROCKWELL INTERNATIONAL
878 ROCKWELL INTERNATIONAL CORPORATION
879 RODCO, INCORPORATED
880 ROTEX CORPORATION
881 ST. ANTHONY HOSPITAL
882 S.&S. PLATING COMPANY
883 SANTA FE RAILROAD

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885 SEARS AUTO CENTER
886 SENTRY MANUFACTURING
887 SERMETEL, INCORPORATED
888 SERVICE PAINT MANUFACTURING COMPANY
889 SHAKLEE CORPORATION
890 SHERWIN-WILLIAM COMPANY
891 SKY WITCH
892 SOLVENT MANUFACTURING COMPANY, INC.
893 SOONER FORD
894 SOONER OIL PATCH SERVICES, INCORPORATED
895 SOUTHERN HILLS COUNTRY CLUB
896 SOUTH PRAIRIE CONSTRUCTION
897 SOUTHWEST ELECTRIC COMPANY
898 SOUTHWESTERN STEEL ROLLING DOOR COMPANY
899 SOUTHWEST UNITED INDUSTRIES
900 SPERRY VICKER COMPANY
901 STAN RAMSEY COMPANY, INCORPORATED
902 STANDARD CHEMICAL COMPANY
903 STAR MANUFACTURING COMPANY
904 STEELCRAFT, INCORPORATED
905 STORM PLASTICS, INCORPORATED
906 SUBLETT & ASSOCIATES
907 SUN GAS
908 TEXACO, INCORPORATED
909 TEXAS INSTRUMENTS
910 TEX PRODUCTS, INCORPORATED
911 THE BUCKET SHOP, INCORPORATED
912 SAMUEL ROBERTS NOBLE FOUNDATION, INC.
913 THOMAS & BETTS
914 THOMPSON HAYWARD CHEMICAL COMPANY
915 UNITED STATES AIR FORCE
916 TRIBONETICS COMPANY
917 TOM BROWN'S OPTICAL
918 TOX
919 TRIGS DRILLING
920 TUFTS & SON OF OKLAHOMA
921 UNARCO COMMERCIAL PRODUCT
922 UNIROYAL TIRE COMPANY
923 UNIT PARTS, BORG-WARNER COMPANY
924 UNITED FOAM
925 UNITED PLATING WORKS, INCORPORATED
926 UNIVERSAL OIL PRODUCTS
927 UNIVERSITY OF OKLAHOMA
928 UNIVERSITY OF OKLAHOMA
929 UNIV. OF OKLAHOMA HEALTH SCIENCE CENTER
930 UNIVERSITY OF OKLAHOMA
931 COLONEL MARY FELTS
932 U.S. CORPS OF ENGINEERS
933 U.S. DEPARTMENT OF ENERGY
934 U.S. POLLUTION CONTROL
935 U.S. POLLUTION CONTROL
936 VETERANS ADMINISTRATION
937 WAYNE CIRCUIT
938 WELCH OIL COMPANY
939 WESTERN ELECTRIC COMPANY
940 WESTERN EXTRACT MANUFACTURING COMPANY

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941 WESTINGHOUSE ELECTRIC CORPORATION
942 WEYERHAEUSER COMPANY
943 WILSON DOWNHOLE SERVICES
944 W.J. LAMBERTON
945 WOLVERINE PIPE
946 ZOECON INDUSTRIES
947 OKLAHOMA GRAPHICS
948 U.S. SMALL BUSINESS ADMINISTRATION
949 GENERAL MOTORS
950 SUPERIOR LINEN
951 O.K. MEMORIAL HOSPITAL
952 JIM'S SEPTIC SERVICES
953 A-A EMERGENCY PLUMBING
954 RIVERSIDE INDUSTRIES
955 WASTE MANAGEMENT
956 INTERNATIONAL SYSTEM & CONTROL
957 P.A. INDUSTRIES-POLAR MANUFACTURING
958 AMAX, INCORPORATED
959 WASTE MANAGEMENT, INCORPORATED
960 SANDTRAP SERVICE
961 FOSTER FEED & SEED COMPANY
962 JOC OIL EXPLORATION COMPANY, INC.
963 ALLIED PAINT CORPORATION
964 BORG-WARNER CORPORATION
965 CLIFTCO, INCORPORATED
966 HONEYWELL COMPANY
967 COOK PAINT AND VARNISH COMPANY
968 CHEMICAL LEAMAN TANK LINES, INCORPORATED
969 DIAMOND PAINT COMPANY
970 EXXON CHEMICAL COMPANY
971 W.R. GRACE & COMPANY
972 GULF STATES PAINT COMPANY
973 RALPH LOWE
974 MAGNA CORPORATION
975 NALCO CHEMICAL COMPANY
976 THE O'BRIEN CORPORATION
977 P.P.G. INDUSTRIES
978 RELIANCE UNIVERSAL, INCORPORATED
979 ROHM AND HAAS TEXAS, INCORPORATED
980 WITCO CHEMICAL COMPANY
981 TRIANGLE ENGINEERING COMPANY

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APPENDIX C

COMMUNITY RELATIONS RESPONSIVNESS SUMMARY ON THE SOURCE CONTROL FEASIBILITY STUDY

C-1

COMMUNITY RELATIONS RESPONSIVENESS SUMMARY

ON THE SOURCE CONTROL FEASIBILITY STUDY

HARDAGE/CRINER SUPERFUND SITE

MCCLAIN COUNTY, OKLAHOMA

NOVEMBER 1986

COMMUNITY RELATIONS RESPONSIVENESS SUMMARY ON THE SOURCE CONTROL FEASIBILITY STUDY

HARDAGE/CRINER SITE
MCCLAIN COUNTY, OKLAHOMA

This document summarizes public comments and Environmental Protection Agency (EPA) responses to questions and concerns raised during the public comment period. The responsiveness summary is divided into four sections:

I. Overview

II. Activities to illicit input and address concerns

III. Summary of public comments and EPA response, and

IV. Remaining concerns

I. OVERVIEW

At this time, the Environmental Protection Agency (EPA) is presenting its response to comments on the Source Control Feasibility Study (FS) prepared for the Hardage/Criner site. EPA has not yet selected its preferred remedy but has developed four remedial alternatives which it believes to be cost-effective plans, meeting all applicable or relevant and appropriate Federal requirements for protection of public health and welfare and the environment.

This site is being managed through the EPA enforcement program. As such, EPA will make a decision on the "baseline" remedy which it feels to be acceptable. EPA will then negotiate with private parties believed liable for the site in an effort to achieve voluntary cleanup of the site. In a parallel manner, EPA is pursuing direct enforcement action under Section 106 of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) and under Section 7003 of the Resource Conservation and Recovery Act of 1976 as amended (RCRA).

When a remedy is proposed, EPA will be seeking public comment. Only after this comment period will EPA make it's final remedy selection.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Major Concerns and Issues

One of the major concerns at the Hardage (Criner) hazardous waste site is evidence from monitoring wells of migration of contaminants from the site and contamination of residential wells offsite. The North Criner Creek alluvium is the primary aquifer of concern.

Deteriorating conditions at the site (i.e., continuous seepage from the pits, exposed barrels from the mound, etc.) and inadequate barriers to retard migration, have given rise to concern for potential surface and groundwater contamination.

Activities to Elicit Public Input and Address Concerns

EPA has kept members of Congress, as well as other elected officials and citizens informed of meetings, plans, and alternatives under consideration. Elected officials and citizens were notified prior to start of the Remedial Investigation and Feasibility Study (RI/FS) process.

Ten families live in the immediate vicinity of the site. Each family was interviewed by representatives of the Oklahoma State Department of Health (OSDH) and the EPA to ascertain their concerns and feelings about the site. Primarily, these citizens' concerns centered around contamination of the groundwater, which was originally discovered in the mid 1970s by the State of Oklahoma in onsite monitoring wells. Since that time, EPA and OSDH have expended considerable joint effort and resources to determine the nature and extent of the contamination. Royal N. Hardage, owner and operator of the site, was sued by the United States in September 1980, seeking investigation and clean up of the site. Although the United States established it's case and won a partial judgement against Royal Hardage, it was unsuccessful in obtaining site clean up, in large part due to Mr. Hardage's bankruptcy. The U.S. Government filed suit in June 1986 against 36 companies believed to be responsible for public health threats posed by the site, seeking performance of remedial actions and further studies as directed by EPA as well as reimbursement of all Superfund costs incurred, which is more than $1.4 million.

A press release announcing the end of the Feasibility Study, start of the public comment period, and a public meeting, was issued by EPA on February 24, 1986. Copies of all formal documents concerning the site were placed in five strategic repositories for the public to review preparatory to making their comments. Preceding the public meeting held on March 20, 1986, EPA briefed the mayors and other city officials of both Chickasha, Oklahoma and Purcell, Oklahoma. At this briefing, EPA reviewed past actions and ongoing and future planned site activities.

SUMMARY OF PUBLIC COMMENTS RECEIVED DURING THE COMMENT PERIOD AND EPA RESPONSE

The public comment period on this FS was from March 10 through April 15, 1986. The FS was placed in repositories and provided to the Hardage Steering Committee (HSC) on February 25, the day after a press release announced the end of FS activities. A March 20, 1986, public meeting was attended by approximately seventy people, nine of whom made statements. Fourteen sets of written comments were received, consisting of over 200 pages. These comments were received from:

1) B&F Engineering - for Weyerhauser
2) Gardere & Wynne - for L&S Bearings, Rotex, and Tribonetics
3) Hardage Steering Committee - a PRP group representing 135 parties, submitted their own comments as well as those of three consulting firms retained by the HSC: Dames & Moore, ERM-Southwest, and MDK Consultants
4) Hildebrandt Tank Service
5) Hill & Robbins - representing U.S. Pollution Control, Inc.
6) The Hardy Horton Family
7) Hunton & Williams - representing Oklahoma Gas & Electric, comments endorsed by AT&T
8) Kerr McGee
9) League of Women Voters
10) Rajeanna Mayo
11) Oklahoma Center for Veterans Rights
12) Pat Shepherd
13) Thompson & Knight - representing Firestone
14) Glenn Webb

Comments were also received during the public meeting from the following parties: Glenn Webb, Kinnan Goleman (for HSC), Neal Garrett, Tom Smith, Roberta Olefield, Linda Wall, Faith Hurley, Ben Kalas (for KWCL news) and Mark Fox.

After analysis of the comments, it was decided to organize the responsiveness summary into seven sections, each dealing with comments on a specific subject. These seven categories are:

A) Adequacy of data,
B) Operable unit approach,
C) Compliance with the NCP,
D) Feasibility Study process,
E) Opportunity for public participation,
F) Recommendation for additional study or interim remedial measures; and
G) Other comments.

A) ADEQUACY OF EXISTING DATA ON THE HARDAGE/CRINER SITE

Several commenters suggested that existing data is inadequate to fully characterize the site and develope a permanent and cost effective remedy. Based on the volume of comments, it appears that either the consultants which these individuals employed are not fully aware of the amount of existing data or that a substantial difference of opinion exists between EPA and the Hardage Steering Committee (HSC) as to what would constitute "adequate data". EPAs "Guidance on Remedial Investigation under CERCLA" indicates in Section 7.2.3 that the extent of investigation should not be more than is "necessary and sufficient" to satisfy site-specific objectives. Such objectives were defined early by EPA and are documented in the November 1983 work plan prepared by CH_2M Hill. In the case of a source control action data must be, and in this case is, adequate to establish the degree of containment of the waste materials with reasonable certainty. The data must also allow developement of feasible alternatives for remediation of the site, screening of these alternatives, and ultimately selection of an appropriate cost-effective alternative for remedial action. As in any engineering or scientific study, 100% of the available data could never be gathered. As more and more is learned about the site, further data gathering efforts will become less productive and of less value in providing new information and more duplicative of previous studies. At this point, the Agency believes that sufficient knowledge of the source areas of waste and their current state of containment does exist to allow decisions based on fact and sound engineering principles (not on assumptions or conjecture) to be made as to the appropriateness, feasibility, and cost effectiveness of a range of source control remedial alternatives as required by the National Oil and Hazardous Substances Contingency Plan (NCP), 50 Fed. Reg. 47950, November 20, 1985.

The level of data gathering suggested by some commenters indicates confusion about the purpose of an FS and the preceding investigative efforts. The data gathered prior to remedy selection on a Superfund site is not intended to be so complete as to allow preparation of detailed design for each remedial alternative or even for the remedy selected. For example, it would make no sense to collect the extensive data required to design four remedies when only one will be selected. The data only needs to be sufficient to determine the most cost-effective feasible remedy protective of public health and welfare and the environment, not inconsistent with the NCP.

Several commenters pointed out what they believed to be data gaps in EPA's characterization of groundwater hydraulics and other contamination outside the source areas. Since a separate RI/FS is planned to specifically address this, the second operable unit, the comments are noted for future reference in development of the workplan for the second operable unit (Management of Migration) RI/FS.

Response to specific questions and comments regarding the adequacy of data is provided below:

Comment: Certain data indicate that the bedrock may be fairly impermeable and caple of preventing waste migration, specifically: the yield of water from interceptor wells installed by the operator are low, as reported in the FS; the packer permeability tests conducted by EPA contractors in 1984 indicate the permeability of bedrock is very low, less than 10^{-7} cm/sec.

Response: It should be noted that the packer tests indicated permeabilities were less than 8×10^{-7} cm/sec. Packer tests, when conducted properly and under favorable conditions, can provide an indication of the permeability around the well bore. This does not necessarily reflect overall permeability of the bedrock or the ability of seepage to move rapidly through joints. The intact bedrock, especially shales, at this site may have hydraulic conductivities on the order of 10^{-7} cm/sec. or less. However, EPA believes secondary permeability (fractures/joints) rather than porosity, characteristics have allowed existing contaminant transport. As stated in the FS, the results of site packer permeability tests would not have been significantly affected by thin, occasional layers with hydraulic conductivities on the order of 10^{-1} to 10^{-3} cm/sec or an occasional thin fracture. This statement is based on estimations of the water loss through a thin pervious layer within the packer test sections. Based on the tests conducted at the site, such a layer would not result in sufficient water loss during the test to result in an overall hydraulic conductivity of greater than 10^{-7} cm/sec, but would allow contaminant migration at relatively high velocities in these secondary channels.

As discussed in the FS, difficulties are inherent in monitoring groundwater quality in a fractured aquifer. The absence of contamination in a single well, for example, cannot be taken with any confidence to mean that contaminants have not reached that general area. This is apparent when one considers the relatively minor area intersected by a well bore as compared to the areal and vertical extent of the aquifer which this well would be intended to monitor (a six inch well bore with a twenty foot long screened-sampling-section might be placed hundreds to thousands of feet from other wells and represent the only data on this section of the aquifer). When groundwater flow occurs through preferential channels, as at Hardage, the

interception of contaminated flow pathways is largely reduced to a matter of chance. The consistent presence of contamination in the majority of wells spaced over a wide area carries great weight in proving the aquifer to be contaminated; and such a situation is correctly taken to represent contamination of the entire area monitored by the contaminated wells.

The yield of the Hardage Wells was reported incorrectly in the FS as one barrel per day. The yield, as stated by Royal Hardage in a 1980 deposition was in fact 25 barrels per day for each of two wells.

Comment: The groundwater contour map presented in the FS was developed with data from different zones. This is not a correct procedure since deeper bedrock may be hydraulically confined or vertical gradients may exist, making contours developed in this manner deceiving.

Response: The Bison and Purcell Formations are undifferentiated at the site, comprising a single unconfined hydrogeologic unit; and present data indicates the bedrock is hydraulically connected in the vertical direction and in communication with the alluvium. Therefore, the use of all water level measurements at the site in preparing the ground-water contour map presented in the FS is only subject to errors caused by vertical gradients. Vertical gradients in ground-water do exist and do influence the phreatic surface obtained from monitoring wells installed to various depths. During the investigation for the second operable unit, nested wells will likely be installed to further evaluate vertical gradients at the site. Based on this information, a refined contour map may be developed. Overall, this only has an impact on the second (management of migration) operable unit.

Comment: Data from waste characterization holes drilled through the sludge mound and main pit suggest that vertical barriers to seepage exist beneath these areas.

Response: Some data, when analyzed in a cursory manner, could indicate barriers to seepage exist below source areas. However, the observed vertical migration of contaminants and their lateral spread into areas where no other pathway could exist but through groundwater transport overwhelmingly indicates that vertical barriers do not prevent susbstantial releases of contaminants from the shallow to the deeper groundwater.

Comment: The vertical extent of contaminant migration has not been defined, neither have the vertical flow gradients that would induce such migration. Such information is needed to fully characterize site hydrogeology and adequately develope and evaluate remedies.

Response: Vertical migration of contaminants through the bedrock to depths greater than 40 feet has been documented to the east, southwest, and directly beneath the source areas. The information obtained from the waste characterization (WT) holes does indicate vertical contaminant migration beneath the source areas, as discussed in the response to latter comments. In addition, ground-water contamination found in wells EW-01, BW-01, BW-04 and GTW-03 indicates contaminants in ground water at depth. In each of these wells, the well screen interval was placed beneath the phreatic surface measured at the well location, thus contamination found at these well locations are beneath the surface of the ground-water table and confirm vertical migration. In addition, several wells and exploratory boring locations were installed adjacent to deeper wells. Although these were not specifically intended to constitute nested wells, information obtained from these locations indicates a gradient from shallow to deep groundwater.

Comment: Piezometric levels of groundwater were measured in January and aren't representative of the entire year due to seasonal fluctuations. This limited data cannot indicate to what degree wastes in the source areas are beneath the water table.

Response: EPA agrees that the levels may represent a low as compared to the rest of the year. However, relative levels and the shape of groundwater contours and flow directions likely represent an annual average and are consistent with those developed by earlier investigators (Baker & Burns, 1980; Kent, 1982). Seasonal fluctuations could be better defined in further studies.

Comment: Geologic cross-sections were not compiled. Such sections could aid in analyzing site geohydrology, and are a tool commonly used to perform such analyses.

Response: The bedrock consists of shales, mudstones, and sandstones which are deposited in discontinous layers. These layers grade gradually back and forth from one rock type to another. Since this gradation occurs in three dimensions, the classical concept of a well defined sequence of horizontal or consistently dipping beds which allows tracing individual layers of the

sequence from one borehole to the next is not applicable. As a result of this graded lithology, EPA could make only limited interpretations and would have had virtually no confidence in cross-sections compiled with data from these or any other bedrock borings. For this reason, cross-sections were not refined or published.

Comment: The site may not be suitable for locating a landfill cell in compliance with RCRA Part 264 regulations; and data is inadequate to make this determination. This should have been considered before retaining the On-site Disposal Alternative through final screening.

Response: EPA believes the existing data indicates that the site is suitable for placement of a RCRA vault; and further study will be conducted for design should this alternative be selected. Due to the widespread contamination on-site, low levels of residual contamination will remain in the soils over which the landfill would be constructed. A questions was raised by one commenter as to the potential problems of monitoring for leaks from the landfill cells, that is, if contamination were seen in monitoring wells questions could arise as to whether it is coming from trace landfill's liner systems. It is EPA belief that monitoring in a possibly contaminated environment will not present insurmountable technical problems since: (1) The vault will have an interior detection system capable of detecting any leaks before they enter a contaminated zone; (2) the vault will be above the groundwater table, eliminating potential up-flow of contaminants into the interior detection system; (3) regular monitoring will likely be required for any remedy, and long term water quality trends could be established, allowing significant leaks from the exterior liner to be detected. The site is located over several thousand feet of sediments and is not prone to earthquakes. The area of the site considered for locating a landfill cell is far above the 100 year flood and also above the probable maximum flood. Thus, the site meets the requirements set forth in 40 CFR Section 264.18.

Comment: The geometry of waste fill is not defined. Without such data, it is not possible to adequately evaluate any alternatives or determine either the Feaibility in in-situ containment or the need for excavation of the source areas.

Response: The base of pits excavated during site operations and later backfilled is defined by depositions of the operator Royal Hardage and confirmed by test holes in these source areas. The borings show bedrock at consistent elevations of about 1109 and 1093 feet mean sea level (MSL) beneath the main pit and sludge mound respectively, thus defining the base of the pits. Magnetometer surveys have located substantial drum concentrations in the drum mound and along the west side of the main pit, also confirming early site inspections and the Hardage depositions.

Comment: A Quality Assurance plan was not prepared in accordance with the NCP. As such, the accuracy of the data and the methods of data collection are questionable.

Response: The Quality Assurance Project Plan (QAPP) is included as Appendix A to the May 1985 Data Summary Report. This QAPP meets all the requirements of the NCP (1982 edition), including concurrence on the plan by the Regional QA officer.

Comment: Sampling from three test holes in the sludge mound failed EPA's requirements for QA/QC. This lack of data prevents EPA from making decisions on the disposition of the materials since it can make no judgement on it's potential threats.

Response: After completion of the Feasibility Study, EPA's Houston Lab was asked to review the data. The principal problem was that lab reporting sheets indicated the units to be parts per million (ppm). Summing the various constituents indicated certain samples with a sum greater than a million ppm, indicating an obvious error. The Houston Lab's review showed that the units were incorrectly reported and in reality should have been parts per billion (ppb) rather than ppm. This has corrected virtually all problems with this data set. The Houston Lab review is documented in an August 1986 letter from Bill Langley (EPA-Houston) to Bob Davis (CH_2M Hill-Dallas).

Data also exists from previous sampling of the sludge mound and in some cases for wastes disposed there. In addition, the types of wastes disposed in the sludge mound are known for the most part to be: styrene tars; drummed aresenic and cyanide; PCB contaminated equipment; and sludges from oil recycling, the analysis of which showed extremely high levels of lead and phenol as well as over 50 ppm of PCBs; and a composite of all other wastes disposed at the site as a result of clean-out of the main pit. Samples taken in 1982

from the surface of the sludge mound indicated PCB-1260, lead, chromium, anthracene/phenanthrene, dichloropheonol, and other heavy metals and synthetic organics.

Comment: Poor well drilling techniques may have resulted in cross-contamination of some monitoring wells and waste characterization holes; thus the results may not indicate deep contamination of soil and/on groundwater.

Responses: Discussion is made regarding the contamination found in the waste characterization holes (WT) beneath the source areas. It is suggested by the commenter that only trace levels of contaminants were detected in bedrock samples beneath the pits and that they are "probably associated with inadequate sampler decontamination... or laboratory contaminants". As presented in the Data Summary Report, EPA (1985), rinsate samples taken from the sampler after decontamination did indicate a few contaminants at parts per billion levels in addition to laboratory contaminants. The contention by some commenters is that bedrock contamination beneath source areas was mainly the result of sampler and laboratory contamination; however, this is not substantiated by overall sample analyses. Consistently, compounds other than those found in the rinsate and laboratory blank samples were found in bedrock samples beneath the sources. In many instances, these compounds had concentrations in the parts per million range (orders of magnitude higher than that shown in blanks). In addition, in several holes, compounds were found in the underlying bedrock samples which were not found in samples taken within the source area nor in rinsate or laboratory blank samples. These compounds are however components of wastes known to have been disposed at the site. The obvious conclusion here is that the wastes were not, as the commenter suggested, carried down the borehole by careless sampling procedures, nor were the compounds introducted at the lab or at any time after the samples were collected; rather the contaminants are in fact, as EPA has previously stated, at depth beneath the source areas and represent the result of actual waste migration vertically out of the waste pits and into underlying sediments. In waste characterization hole (WT-006), the results of the analysis of the composite sample comprised of samples from 28,33 and 38 feet showed very few volatile compounds; however, the sample taken at 43 feet showed many more volatile compounds present. EPA believes this pattern of contamination is more indicative of vertical migration through the bedrock along secondary permeability features than the result of trace

contamination on sampling tools. Well GTW-03 showed contamination in groundwater as did the nearby BW-04 well; however, analysis of borings taken from GTW-03 showed no contamination of the overburden, thus precluding contamination of this well during construction.

(For further discussion, refer to a previous comment on vertical migration of waste page C-8).

Comment: No data exists to support EPA's contention that a hazard exists from air on the site.

Response: EPA recently sent its Emergency Response Branch (ERB) to the site for purposes other than air monitoring; however, this was also done while on-site, sampling with a photoionization unit showed readings less than 1 ppm in air. It has been observed that odors are much worse on-site in wet weather than dry wheather-when ERB visited the site. At this time, EPA must reply that it has no data which indicates an air hazard from organic vapors exists on-site at this time. It is entirely possible however, that deteriorating site conditions could pose threats by this exposure pathway.

Comment: Use of area groundwater is not adequately assessed to determine the need for remedial actions.

Response: Those groundwater supplies with the potential to be immediately affected have been considered. Other supplies which could ultimately be impacted as wastes migrate farther from the site will be assessed in detail during groundwater/off-site studies.

Comment: The groundwater pathway of contamination transport off-site has not been sufficiently defined. The potential for groundwater contamination has been cited as one factor requiring remedial action, yet it's potential impact have not been adequately assessed.

Response: Pathways of groundwater contamination transport were only considered insofar as they indicate a general inability of the bedrock to provide a reasonable degree of containment of wastes in the source areas. The presence of contamination in the alluvial aquifer of North Criner Creek and the route of transportation from the source areas are by and large irrelevant to the question of the adequacy of barriers beneath these

source areas several thousand feet away. EPA still believes that contamination of this aquifer has resulted from combined runoff and sub-surface transport. The question of which pathway has contributed what to current contamination is of only academic importance, since significant subsurface migration has occurred in this and other directions, and contamination of the alluvium by this method will continue or began to occur until the sources are exhausted.

Comment: Source areas may exist which have not yet been identified. If this is the case, then the source control FS is incomplete.

Response: Sufficient information on the operating history of the site is available from Oklahoma State Department of Health (OSDH) inspections from 1972-1980 and from the operators depositions to confirm that Mr. Hardage made efforts to consolidate wastes in the main pit/drum mound and sludge mound. Site samplings and recent inspections give no reason to doubt the belief that the major concentrations of solids, sludges, and drummed wastes are located in the three principal source areas addressed by EPA in its FS.

Even if other major source areas did exist, it would not preclude EPA from addressing the drummond, main pit, and sludge mound as a single operable unit. The NCP provides no such constrainst on what must be included in an operable unit or on how many operable units a site may be divided into.

Comment: Background quality of groundwater has not been determined. Without knowledge of background concentrations of chemicals or elements, it is impossible to determine if the site is contributing the compounds or if the levels are naturally elevated and unrelated to the site.

Response: The background levels of synthetic organics (such as solvents) in this rural area is essentially zero with the possible exception of pesticides from agricultural application, and trace levels of natural phenol in groundwater. The background levels of inorganics will be fully addressed in the Management of Migration RI.

Comment: The extent of groundwater contamination has not been adequately defined; and no plume has been shown to emanate from the source areas. As a result, it is premature to determine that groundwater contamination requires any remedial action.

Response: Great difficulties exist in monitoring a fractured aquifer where migration is along preferential channels, and where a heavily contaminated zone might lie within a few feet of an apparently clean monitoring well. This characteristic makes the classical concept of a contaminant "plume" misleading and inappropriate for describing migration patterns at this site. In future studies, EPA will undertake to delineate the plume present in alluvium of North Criner Creek, further define the lateral extent of groundwater contamination in the bedrock, and evaluate the potential for contaminants to migrate beneath stream drainage divides near the site. Such investigative activities properly fall within the scope of the second operable unit.

Comment: Trends show water quality is improving with time. This could indicate that the situation is not worsening, but rather that the groundwater system is recovering by natural processes.

Response: The historical water quality data is indicative of the presence of off-site contamination. It is not felt that trends in contaminant concentrations can be drawn from the information, since the samples were taken by various parties using widely varying sampling procedures. Specifically, some samples were obtained from taps at the residences rather than directly from the well, thus subjecting the water to aeration during pumping and stripping of some volatiles.

If off-site sampling results from various sources were comparable, the well with the largest historical data base (the old Corley well), does not show any trend whatsoever. Contamination is similar to the levels first seen in late 1982, two years after the site closed.

B) EPA's OPERABLE UNIT APPROACH TO THE HARDAGE/CRINER SITE

Comments were received which questioned the technical and legal justification for EPA's decision to divide the site remediation of groundwater/off-site contamination as discrete and separable problems.

EPA has addressed a substantial number of NPL sites, including several in Region 6 (Bayou Bonfuca, Gurley Pit, Vertac, Motco, Highlands Acid Pits, Odessa Chromium I, and Odessa Chromium II), by dividing the response into operable units. These divisions are made based on technical information for the site and the criteria presented in the NCP. As noted in the FS, EPA believed at the time the division was made, and continues to believe, that a substantial quantity of wastes remain in or near their original location and are not contained by adequate barriers and that a remedy for source control will be cost-effective and consistent with a premanent overall remedy for the site, thus meeting criteria set forth in the NCP for operable unit remedial response. The best engineering judgement of the Remedial Site Project Officer (RSPO), EPA Regional and Headquarters managers, and EPA contractors was that the vast majority of releases of hazardous substances to the environment could be abated by controlling these source areas which comprise less than 10% of the site area. Strategies for cleanup of existing groundwater contamination or knowledge of the necessity of such actions is not necessary in order to determine the best method of containing the wastes. Source control and management of migration are in this case clearly seperable; therefore, further delays are unnecessary and would be inconsistent with provision of a timely response to a situation posing an imminent and substantial endangerment to public health and welfare and the environment.

Response is provided below to specific comments on the operable unit approach taken on the Hardage site.

Comment: No technical justification exists for an operable unit approach to the Hardage site; the decision to address the site in this manner was driven by budgetary problems and previous delays in completion of the FS.

Response: The technical justification for splitting the site into operable units is strong, as discussed above. The questions about pathways of contaminant transport to offsite alluvium and the extent of surface contamination away from the source areas are not mandatory considerations in the question of source control and the existence of barriers to migration. Since all proposed source control alternatives involve waste excavation and stabilization, which remedy is finally selected is not a concern in relation to the Management of Migration operable unit, therefore delays to determine the groundwater/offsite remedy are unnecessary. The criteria set forth in the NCP for use of operable units has been met; and no strong justification exists for not using the approach and further postponing cleanup of the site. The comment that EPA employed operable units due to budgetary problems is unfounded; the cost of the DSR/FS project was slightly over $800,000 less than is sometimes spent or far less complicated sites.

Comment: EPA has worked on the site for three to five years; so expediting the remedy makes no sense at this point. Further studies should be conducted and a new FS prepared to address the site as a whole rather than as operable units.

Response: EPA first inspected the Hardage site in July 1979; and a complaint was filed against the operator in September 1980 under Section 7003 of RCRA. While EPA has been involved with the Hardage site for nearly seven years now, active Superfund involvement did no begin until 1984. Field work was commenced by EPA in July 1984 and the FS was released in February 1986, twenty months later; the normal period of time in which EPA attempts to complete its investigations and FS on Superfund sites is eighteen months. Delays on this site under Superfund have have not been exceptional; and any delays which have occurred do not provide a justification for further unnecessary delays.

Comment: A cost effective remedy can't be selected without knowing the final remedy for other parts of the site.

Response: The situation at Hardage is such that excavation and treatment of the waste piles and pits is required (FS, pages 3-22 through 3-36). Therefore, the cost-effectiveness consideration is reduced to a comparison of various treatment technologies and their relative feasibility, benefits, and permanence. Cost-effectiveness considerations are only to be applied in comparisons between acceptable remedies in accordance with Section 300.68 of the NCP.

Comment: A remedy for source control should not have to meet applicable or relevant and appropriate requirements since it is not the final remedy [(NCP, Section 300.68 (i)(5)(i)].

Response: The remedies which EPA has developed and evaluated, while not addressing the entire site, are permanent for the source control operable unit. As such, response actions must be in accordance with these requirements just as if this remedy were for all aspects of the site. The passage cited in the NCP refers to interim remedial measures (such as a temporary cap) which may be implemented while further study or planning is conducted for the permanent remedy.

Comment: The lack of data needed to complete a FS for the entire site prompted EPA to divide the site into operable units; and these same data gaps also plague the source control FS. This prevents EPA from determining the nature and extent of the threat posed or evaluating proposed remedies.

Response: The "data gaps" are of a quite different nature than the commentor has implied. Data indicates that releases from the site are uncontrolled; and knowledge to site conditions indicates the situation will worsen.

Data is inadequate to determine the appropriate remedy for contaminants that have already left the site or the extent of cleanup required for surface mixing areas which may remain contaminated. However, it is EPAs opinion that the existing data is adequate to allow development of a source control Feasibility Study. The blanket statement that these inadequacies plague the FS was not supported with examples by the commentor. And in the conduct of the FS, EPA has certainly not felt itself to be "plagued" by this or any other lack of information.

C) EPA COMPLIANCE WITH THE NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN (NCP), 40 CFR PART 300*

Several commenters questioned EPAs compliance with the NCP during conduct of response action at Hardage. The comments ranged over many points of the NCP, but were centered on Subpart F - Hazardous Substances Response.

General comments were that EPA had not adequately characterized the site; the screening of remedial alternatives was flawed or biased; an operable unit approach is not valid for Hardage; applicable or relevant and appropriate requirements for protection of public health or welfare or the environemnt were incorrectly applied or should not have been applied at all; EPA should have further considered waivers provided in the NCP and further evaluated those alternatives providing less than adequate protection of public health and welfare and the environment; and cost-effectiveness was not given adequate consideration.

One important purpose served by the NCP is to provide consistency in application of CERCLA from one site to another and from one Regional program to another; and deviations from the NCP could possibly reduce this consistency. The current NCP was followed at all points through the FS process; and compliance with the NCP was a major factor in review of drafts of the FS. Where formal guidance documents and memos covering compliance with the NCP existed, the material was used. As a result, EPA believes that the FS is entirely consistent with the NCP.

Response to specific comments is given below.

Comment: EPAs failure to perform a formal RI is inconsistent with the NCP since: 1) the NCP does not suggest EPA may decide not to conduct an RI when one is clearly appropriate; and 2) the data collected does not serve the purpose of a RI.

Response: The NCP directs that EPA shall "as appropriate" perform an RI/FS. This passage does not bind EOA to do an RI if it is not appropriate. EPA determined that a discrete RI was not appropriate in light of the already extensive data compiled on the site. The purpose of an RI/FS, as explained in the nature and extent of the threat presented by the release and to evaluate proposed remedies (50 Fed Reg). This purpose has been met.

*The NCP was promulgated, and is periodically revised, as required by CERCLA, Section 105. The NCP sets forth the approach to be used in implementing CERCLA. The most recent revision of the NCP was February 18, 1986 (50 Fed. Reg. 47912-47968.

On the other hand, EPA believes that the aggregate of prior studies and data on the site, when combined with its "Field Investigation and Data Summary Report", would in fact constitute a record of substantial equivalence to a discrete RI. Therefore, the decision was made to move directly to the FS.

EPA must make decisions on how to proceed in cases such as this based on the best judgement of the RSPO and EPA managers, and it has acted in a manner not inconsistent with the NCP in deciding against the additional investment in time and effort an RI would have involved. The commenter does not elaborate on why a descrete RI was "clearly appropriate" on this site.

Comment: The FS is not the functional equivalent of an Environmental Impact Statement (EIS) as required by the National Environmental Policy Act of 1969 since the FS does not contain a cost/benefit analysis.

Response: Conduct of a cost-benefit analysis is not required under CERCLA; this is confirmed by the Act's legislative history (136 Cong. Rec. §16427 (1980).) Furthermore, the public comment period on the FS serves the opportunity for comments required under NEPA prior to expenditure of public funds.

Comment: The five waivers applying to remedy selection as set forth in the NCP Section 300.68 (i)(5) should be applied and a remedy selected which does not meet or exceed applicable or relevant and appropriate requirements for protection of public health or welfare or the environment, due to the high cost of remedial actions meeting these requirements or due to other circumstances set out in the NCP.

Response: The five waivers are stated below along with the reasons they cannot be applied to the Hardage site.

1) Remedy will become part of a more comprehensive remedy - This is the final remedy for source control.

2) Fund-Balancing - This test is normally applied where there is a fund-financed response. This is an enforcement lead site; but there is nothing to indicate fund balancing would be involved even if this were a fund-financed response.

3) Technical Inpracticality - Remedies meeting requirements are technically feasible and can be implemented.

4) Unacceptable Environmental Impacts - This is not anticipated since the impacts of continued release out weigh those associated with remedial action.

5) Enforcement action where the fund is not available, public desire for cleanup is strong, and litigation would probably not result in a better remedy - EPA believes that, if necessary, litigation will produce the desired result and fund may be available. It should be noted that Hardage/Criner is a National Priority List (NPL) site, so the Superfund may be applied to remedy the site if the Agency chooses.

For the above reasons, the waivers will not be applied; and the selected emedy will comply with all applicable or relevant and appropriate requirements.

Comment: Consideration of incineration as a disposal option violates the cost-effectiveness requirement of the NCP.

Response: Incineration was retained for consideration since the environmental benefits of organics destruction compared to waste treatment and landfilling are significant. EPA believes consideration of waste destruction alternatives, such as incineration, is warranted and that the failure to consider waste destruction would be contrary to the Agencies commitment to consider permanent remedies including those which exceed applicable or relevant and appropriate requirements.

Comment: Scoping of response actions was not conducted in accordance with Section 300.68(e) of the NCP.

Response: EPA believes that it in fact has properly considered all of the scoping factors required by Section 300.68 of the current and former NCP, as appropriate. Other comments on compliance of the FS with the NCP are addressed in the following section.

D) The FEASIBILITY STUDY (FS) PROCESS

Comments were received to the effect that the technology screening, alternative development and screening, and other components of the Feasibility Study process were flawed due to a lack of data or non-compliance with the NCP.

While it is true that a lack of adequate data could bias the results of the FS by forcing the preparers into unwarranted assumptions, the discussion provided in Section A of this summary regarding what constitutes "adequate data" is referenced. And, as in response to comments in that previous section, it is again stated that EPA believes the data is adequate for the purpose of a FS on Source Control. The data may not be adequate for detailed design; but that is not the present objective. The purpose of this FS is merely to present analysis and discussion sufficient for selection of a permanent remedy for source control.

Comment:

"(EPA) has rejected alternatives found to be protective of public health and welfare and cost-effective at numerous other Superfund sites". This commenter expressed the opinion that EPA had inappropriately rejected in-place containment alternatives. The commenter went on to cite 15 Superfund sites in other Regions which they felt were in conflict with the remedies considered at Hardage. These sites are:

Region #1	Beacon Heights Lanfill, Connecticut; McKin County (Landfill), Maine;
Region #2	Love Canal, New York; GEMS Landfill, New Jersey; Sinclair Refinery, New York; Helen Kramer Landfill, New Jersey
Region #3	Heleva Landfill, Pennsylvania; Lackawana Refuse, Pennsylvania; Taylor Borough Dump, Pennsylvania Douglasville Disposal, Pennsylvania
Region #4	White House Waste Oil Pits, Florida
Region #5	Wanconda Sand & Gravel, Illinois New Lyme Landfill, Ohio
Region #10	Ponders Corner, Washington South Tacoma Channel, Washington

(No sites were referenced in Region #6, where Hardage/Criner is located.)

Response:

At this time, there are hundreds of sites on the Superfund National Priority List. These sites present unique combinations of factors involving geology and hydrology, as well as the age, quantity, and chemistry of contaminants, among other things. For this and other reason, neither Congress nor EPA has ever taken the position that consistency between or among Superfund sites is the measure of the appropriateness of Superfund remedial action at any given site. The specific test upon which basis Superfund remedial actions are judged is their consistency with the NCP. In numerous policy promulgations, EPA has attempted to further clarify those principles which guide Superfund response efforts. The policy and guidance documents have changed during the past six years of Superfund implementation; and they will continue to evolve and expand their scope in the future, reflecting a predicted increase in the body of knowledge concerning contaminant chemistry, health and environmental effects, contaminant fate and transport, and waste control, treatment, and destruction technology, among other things. As addressed elsewhere within this responsiveness summary, as well as within the FS itself, EPA believes that its remedial action proposals are not inconsistent with the NCP as discussed in the previous section of this Responsiveness Summary.

For informational purposes, a brief summary of characteristics, differences, and similarities of the 15 indicated sites vis-a-vis the Hardage site is presented below, along with a summary comparison of their respective remedies. As the information presented suggests, the commentator's point is at best overly simplistic and factually inaccurate. Review of these sites readily shows why capping may be an acceptable component of the remedies (just as capping may be included in the second operable unit at Hardage). The 15 sites referenced can generally be broken into four categories as discussed below:

Contaminated Municipal Landfills:

Beacons Heights, Heleva, Lackawana, Taylor Borough, New Lyme, and Wauconda fall into this category. Such sites are characterized by relatively minor amounts of hazardous materials co-mingled with large volumes of municipal trash. In this type of situation, wastes are of a far different nature than the highly concentrated wastes at Hardage.

Capping of wastes in-places was used only on two sites, Beacon and New Lyme. At New Lyme, little or no groundwater contamination has occured or is likely due to hydrogeology. At Beacon Heights, contaminants are dispersed and removal is not feasible. Two other sites, Lackawana and Taylor, utilized capping only after partial waste removal. In both cases, well defined concentrations of drums were present and were removed; the wastes capped were almost exclusively municipal in nature. One site, Wauconda, used a cap as an interim measure. The purpose of the cap was to control surface seepage to a stream.

Waste Oil Recycling/Refining Operations:

The McKin, Sinclair, Douglasville, White House, and South Tacoma sites fall into this category. At such sites, the principal concerns are open pits of liquid waste and waste spills. Spills represent dispersed waste for which removal would rarely be a feasible option. Pits are drained on most such sites, resulting in almost total source removal. At all five sites noted above, emergency or remedial actions included partial or complete source removal followed by capping of contaminated soils in former source areas. This is analogous to the proposed removal of source areas and possible capping of the former pits at Hardage.

Hazardous Waste Landfills:

The Love Canal, GEMS, and Helen Kramer sites are in this category. Hardage is similar to these sites only in the respect that similar waste types were disposed. At Helen Kramer and Love Canal, barriers to vertical migration exist. The layers make slurry wall cut-off feasible; sands overlying the aquitards lend themselves to easy construction of the wall and simple and effective groundwater management. At the GEMS site, no shallow layer is present; however, a thick sand layer allows effective groundwater management. In addition, drummed liquids are not present as they are at Hardage.

Presented below is a brief summary of site characteristics, differences and similarities between the site and Hardage.

Beacon Heights Landfill Region #1 #203 on NPL

Beacon Falls, Connecticut

- municipal/industrial waste landfill operated 1920-78
- little drummed or other waste remains; most waste was burned as it was received and only its residues remain
- groundwater is contaminated in fractured bedrock

Remedy-Upgrade cap; groundwater decisions deferred

Comparison to Hardage:

Similarities - fractured bedrock underlies both sites

Differences - The majority of waste once disposed at Beacon Heights is municipal. Little waste remains in its original location, most has been burned or already released to the groundwater system.

Remedial Elements:

The sites are not comparable since a well-defined source is present at Hardage; and the sources at Beacon Heights are dispersed, making source control inappropriate.

McKin County (landfill) Region #1 #33 on NPL

Gray, Maine

- waste oil recycling site operated in the late 1970s
- soils are heavily contaminated by spills of solvents
- all surface tanks and drums have been removed;

Remedy:

Soil contaminated above the clean-up level (11,000 cubic yards) will be excavated; soil will be aerated and the off-gas burned; capping will be over areas below the clean-up level

Comparison to Hardage:

Similarities - solvents contaminate both sites

Differences - McKin was a recycling as opposed to disposal facility; no drummed wastes remain on-site

Consistency with removal at Hardage:

In both cases wastes will be excavated and properly disposed. McKin is farther along in remedial process (cleanup levels selected already) but the remedies appear entirely consistent.

GEMS Landfill — Region #2 #12 on NPL

Gloucester Township, New Jersey

- industrial waste landfill operated from 1970 to 1974
- solid and liquid waste was mixed in pits; few or no drums were disposed
- 6 million cubic yards of contaminated fill present
- 150 feet of permeable sands underlie site, making groundwater recovery feasibile

Remedy:

Cap site; pump and treat groundwater to remove leachate and lower water table below wastes

Comparison to Hardage:

Similarities - similar wastes present

Differences - No drums are in the fill at GEMS. Geology makes groundwater management a feasible and effective method for intercepting seepage near the source, unlike at Hardage.

Remedial Elements:

At Hardage, drummed liquids are present in the fill and the underlying interbeded and fractured bedrock does not lend itself to groundwater management. These complicating factors make the remedy used at GEMS inappropriate for Hardage.

Helen Kramer Landfill Region #2 #4 on NPL

Mantua Township, New Jersey

- industrial waste landfill operated from 1970 to 1980
- 2 million cubic yards of waste
- all types of waste are present including drummed wastes
- the site is underlain by a shallow sand aquifer and a deeper aquitard.

Remedy:

Cap the fill; install a slurry wall upgradient and a collection trench downgradient, both with their base tied into the aquitard.

Comparison to Hardage:

Similarities - drummed and bulk wastes in industrial type fill

Differences Containment of the wastes directly beneath the site is feasible due to the presence of a barrier to vertical migration at Helen Kramer.

Remedial Elements:

The lack of a barrier to vertical migration at Hardage prevents effective containment in place as is possible at Helen Kramer.

Ponders Corner Region #10

Tacoma, Washington

- dry cleaner dumped sludges on the companies property
- solvents have contaminated groundwater
- sludge piles (sources) were previously removed by the State of Washington

Remedy:

Air stripping towers are in-place on municipal wells and are serving the dual purposes of groundwater collection and treatment; limited excavation with off-site is disposal planned for the most heavily contaminated soils.

Comparison to Hardage:

Similarities - solvent contaminated groundwater

Differences - Little of the source remains, most is dispersed into groundwater system or previously removed; collection and treatment of groundwater is feasible;

Remedial Elements:

The contaminant source at Ponders Corner has dispersed from it's original location, making source control inappropriate. For this reason the sites are not comparable.

Love Canal Region #2 #136 on NPL

Niagra Falls, New York

° abandoned canal was backfilled with industrial wastes and closed in 1952; 21,000 tons of wastes including drums are in the fill

° low-level contamination is present in several media

° canal excavated in sand overlying plastic clay and till; situation allows containment in place

Remedy:

Cap was upgraded; slurry walls installed, tied into clay layer; groundwater collection and on-site treatment system in-place; further studies are under way due to concern over vertical migration of leachate to bedrock and the possible inadequacy of in-situ containment.

Comparison to Hardage:

Similarites - drums in fill; similar contaminants

Differences - low-level contamination outside the canal as compared to Hardage; containment is feasible due to geology

Remedial Elements:

The shallow clay layer beneath Love Canal is thought to allow wastes to be contained beneath their original location; however, the adequacy of this layer is still being evaluated. The lack of such a layer at Hardage prevents consideration of such containment.

Sinclair Refinery Region #2 #117 on NPL

Wellsville, New York

° former refinery operation with two on-site landfills; soil was contaminated by spills

° fill contains principally bulk wastes

° small fill area (2 acres and 10-15 feet thick) is adjacent to a river and is being eroded; larger fill has a clay liner

° groundwater contamination is present but believed to result from spills on the site rather than releases from the landfills

Remedy:

Excavate the small fill areas, consolidate with the larger landfills and cap; groundwater will be addressed in other operable units

Comparison to Hardage:

Similarities - Removal is part of the EPA remedy on both sites.

Differences - Groundwater contamination is primarily from spills and already dispersed contaminants rather than the fill or concentrated source areas.

Remedial Elements:

The landfills at Sinclair are not leaking; at Hardage they are. For this reason, source control at Sinclair only needs to stabilize wastes against flooding and erosion. If necessary, groundwater management would likely be feasible in the river aquifer.

Heleva Landfill Region #3 #162 on NPL

North Whitehall Township, Pennsylvania

° low level solvents comingled with sanitary waste

° "source" of off-site contamination appears to be contaminated groundwater beneath the landfill itself

° little or no drummed waste is believed present

Comparison to Hardage:

Similarities - Similar contaminants observed off-site

Differences - Little free liquid appears present in the fill at Heleva, while a large source is present at Hardage. Since contaminants have generally left the Heleva fill, Source control is not appropriate

Remedy:

Capping with groundwater pumping and treatment

Remedial Elements:

At Heleva, the "source" of contamination has generally entered the groundwater system. This type of situation is best remedied by removing the contaminated groundwater. Since a large volume of free liquids is not present in the fill at Helelva, capping was assumed adequate to prevent further contamination of the groundwater. Such a system is not adequate at Hardage due to the physical differences between the sites noted above.

Lackawana Refuse Region #3 #453 on NPL

Old Forge Borough, Pennsylvania

- sanitary landfill operated through 1976; fill was in old coal pits
- 10,000 drums dumped in one pit over 4 months in 1976
- geology makes the groundwater contamination threat to the public miminal

Remedy:

Remove all drums from pit and dispose off-site; cap former pit area

Comparison to Hardage:

Similarities - drummed wastes present; removal is part of the EPA remedy

Differences - groundwater contamination is less extensive than at Hardage

Remedial Elements:

Hazardous materials will be removed from both sites; at Lackawana the municipal wastes will be capped. The remedies are consistent since, in both cases, the wastes will be excavated and properly disposed.

Taylor Borough Dump Region 3 #635 on NPL

Taylor Borough, Pennsylvania

- municipal/industrial landfill
- site consists of six distinct areas with varying degrees of contamination
- drums are present in some parts of the fill
- the decision on groundwater issues has been deferred to a later operable unit

Remedy:

Remove all drums; cap areas of surface contamination and municipal fill

Comparison to Hardage:

Similarities - drummed waste present; removal is part of the EPA remedy

Differences - surface contamination will be capped at Taylor, while its disposition at Hardage has not yet been determined.

Remedial Elements:

Concentrated areas of source materials have been or will be removed on both sites. The hazardous wastes at Hardage will be dealt with in the same general manner as were similar wastes at Taylor. For this reason, the remedies at both sites appears consistent.

Wauconda Sand & Gravel Region #5 #126 on NPL

Wauconda, Illinois

* municipal landfill operated from 1940s to 1979

* less than 3% of the 5 million cubic yards of waste is hazardous/industrial

* fill is in abandoned sand and gravel pit

* groundwater contamination is negligible

Remedy:

Interim remedy is a cap to prevent surface seepage into a nearby stream. Further study will be done on the groundwater operable unit.

Comparison to Hardage:

Similarities - Both sites have been split into operable units.

Differences - Hardage accepted almost exclusively industrial and hazardous wastes; Wauconda has only a very small percentage of this type waste. Groundwater has been contaminated at Hardage, unlike Wanconda.

Remedial Elements:

Factors making waste excavation necessary at Hardage are not present at Wauconda. Specifically, Hardage contains a large volume of hazardous substances which have been and continue to be released and extensive groundwater contamination is not a driving force behind remedial action at Wauconda. Source control and the cap are prinicpally directed at controlling surface seepage. Such differences make comparison of the sites difficult.

New Lyme Landfill Region #5 #626 on NPL

Ashtabula County, Ohio

* municipal landfill which accepted industrial waste

* little is known on volume or types of waste

* little groundwater contamination

* if necessary, groundwater management is probably feasible

- groundwater discharge (up-flow) controls local hydrogeology and protects groundwater below fill

Remedy:

Construction of a RCRA compliant cap over the fill.

Comparison to Hardage:

Similarities - Relatively small amounts of some wastes disposed at Hardage are present at New Lyme

Diffences - Little groundwater contamination compared to Hardage site. No significant amounts of industrial waste was disposed at New Lyme.

Remedial Elements:

The groundwater flow system at New Lyme acts to prevent seepage out of the landfill. Since such a natural system is present, groundwater is not extensively contaminated and a large liquid/sludge source of contaminants is not present, source control is relatively straightforward. If necessary, groundwater management would likely be feasible unlike at Hardage. The sites are generally not comparable.

White House Waste Oil Pits Region #4 #132 on NPL

Whitehouse, Florida

- waste oil recycling facility
- Emergency Response cleaned out pits and capped the pit areas
- groundwater contamination present

Remedy:

Repair caps; install slurry wall and pump and treat groundwater.

Comparison to Hardage:

Similarities - groundwater contamination; waste removal was integral to remedy

Differences - waste source areas have already been removed at White House; and geology makes groundwater management feasible

Remedial Elements:

The site remedies are quite similar. In both cases, the source areas were removed. The capping and slurry wall at White House are similar to measures which could be considered, for the second operable unit after the sources have been removed.

Douglasville Disposal Region #3 #103 on NPL

Douglasville, Pennsylvania

- oil recycling facility;
- site is located adjacent to river and subject to flooding
- in previous actions, drums were removed; lagoons cleaned out and sludges land farmed on-site; spills have contaminated site
- groundwater and soils are contaminated
- river alluvium underlies site; slurry walls are feasibile to cut off lateral flows

Remedy:

Cap site; and build flood control levee; a slurry wall may be part of the groundwater remedy

Comparison to Hardage:

Similarity - groundwater and soil contaminated

Differences - former oil recycling facility; source areas have already been removed; groundwater management is feasible

Remedial Elements:

Source areas have been or will be removed on both sites; the remedies are consistent in that similar wastes are handled in a similar manner (i.e. excavate and treat hazardous wastes).

South Tacoma Channel (Commencement Bay) Region #10 #11 on NPL
Tacoma, Washington

- waste oil recycling and tank clean-out facility operated in 1960s
- filter cake containing tetrachloroethylene (PCE) was used as fill soil
- contaminants from spills are dispersed in the soil and underlying aquifer

Remedy:

Excavate hot spots of PCE and install vapor extraction points in the ground. Continue air-stripping water in a nearby municipal well.

Comparison to Hardage:

Similarites - groundwater contamination

Differences - source of contamination is spill areas which have already dispersed into the groundwater system; groundwater managment is feasible.

Remedial Elements:

At South Tacoma, the waste is dispersed and source control is not applicable. The cap in this case has a very specific and limited purpose, to allow solvent vapor extraction.

Other comments related to the Feasibility Study process are as follows.

Comment: "A rotary kiln incinerator has the potential for incinerating the site wastes, but its feasibility has not been demonstrated." Process upset could result in the emission of dioxins and furans. The mixture of wastes present would pose problems over and above those associated with a costant waste stream.

Response: Incineration of the specific mixture of wastes present at Hardage has not yet been demonstrated. However, the types of waste present have generally been destroyed in this manner. The problems cited contribute to the cost of over $300 million estimated for incineration alternatives. Bench tests and possibly pilot studies would be essential to the remedial design as would be emissions testing.

EPA considers incineration on virtually all Superfund sites where organic contamination exists. It is never stated that the construction and operation of an incinerator would be simple, only that at this point it appears feasible, and warrants consideration due to it's benefits.

Comment: Incinerator ash may be eligible for de-listing as a RCRA hazardous waste on a site specific basis.

Response: If treatment of ash removes the characteristics of a hazardous waste (primarilly EP Toxicity in this case), the ash may be eligible for delisting. Based on a risk-assesment, delisting could be considered after it is demonstrated that the above criteria could be met.

Comment: On-site incineration provides no time advantage over off-site incineration, since the off-site treatment won't take 10 years as assumed in the FS.

Response: The 10 year figure was based on current backlogs for existing units. While capacity may increase in the future demand will also increase. Reduction of the 10 year figure is not warranted at this time.

Comment: Groundwater recovery (pumping) would be feasible in the bedrock and should not have been eliminated from consideration.

Response: The commenter has ignored the extensive data collected indicating fracture zones, uniformly low yield, and the fact that wells pumping from fractured bedrock will produce a small cone of depression. For this reason, withdrawl wells would have to be closely spaced and very deep, creating an large quantity of

Although the system would still allow substantial releases as described in the FS, groundwater recovery by withdrawl from a collection trench system as described in Alternatives 4 and 5, was deemed feasible.

Comment: Technologies for reuse or recycling of waste should have been considered, particullarly "Basic Extraction Solvent Technology" (BEST) as employed on the Savanaha site in Georgia.

Response: As noted in the FS, the extreme variability of the wastes at Hardage virtually eliminates the use of known reuse/recycle alternatives. Solvents Extraction is quite useful where wastes are homogerous liquids. However, the waste stream at Hardage is highly varied and much is a high density sludge. The application of solvent extraction to high solids content wastes will only result in a minimal reduction in volume to be dealt with. Reuse/recycle treatments will be considered for certain wastes if technologies become apparent or are developed.

Comment: If the site had been operated after 1980 then capping would have been an acceptable measure for closure under RCRA. Yet EPA states that capping is not viable enough to even consider as an acceptable remedy.

Response: The site was not operated after November 1980, partially due to the operators inability to meet new requirements for hazardous waste land disposal facilities which went into effect at that time. Facilities which legally operated after November 1980 presumably were better managed with at least some safeguards built in. In some cases this may make capping adequate for containing the wastes. The Hardage facility had no such safeguards and bedrock has been found to provide inadequate barriers; therefore, simple closure in-place is not acceptable. (Note: The commenter went on to argue against the application of other provisions of RCRA as applicable or relevant and appropriate requirements).

Comment: The factors used to screen all alternatives and eliminate several were inconsistent with those dictated by the NCP. If the appropriate factors had been applied, then the FS might have reached different conclusions.

Response: Section 300.68(g) of the NCP states that, "Three broad criteria shall, as appropriate, be used in the initial screening of alternatives." The three "broad" factors to be used are cost, acceptable engineering practice, and effectivness. The ranking factors used in screening of alternatives in the FS were:

reliability, implementability, safety, environmental, institutional and cost. The factors considered fell in the broad categories listed in the NCP and are consistent with the screening factors listed in EPA's FS guidance.

Comment: The alternatives which should have been retained for further consideration in the FS were Alternatives: #3-Capping, #5-capping with perimeter drains, #7-On-site landfill, and #10 Off-site disposal.

Response: The commenter suggest considering two alternatives which EPA rejected (#3-Capping and #5- Capping with Perimeter Drains). Documentation for rejection of alternatives numbered 3 and 5 is provided in the FS on page 3-27,28 and 3-29,30 respectively. The principal reason for rejecting these alternatives is their inability to significantly reduce the release of leachate into the groundwater system.

The commenter also suggest rejecting two alternatives which EPA retained (#8- On-Site Incineration and Disposal and #9-On-Site Incineration/Offsite Disposal). EPA disagrees with the commenter. Congress, in the 1984 ammendments to RCRA, has determined that land disposal of soils contaminated with certain wastes, including many solvents, should be banned, although a two year extension is provided for CERCLA response actions. Prior to such regulation, some facilities may be hesitant to accept a large volume of waste with bans pending on it. Destruction of organics is an enormous benefit, in that the destroyed compounds will no longer be capable of posing threats to the public or environment.

EPA is specifically directed by the NCP to consider alternatives exceeding requirements. Incineration falls into this category and the benefits may prove commensurate with the costs; therefore consideration of incineration is appropriate.

Comment: The adverse effects of waste excavation were not considered. These may pose unacceptable environmental impacts and be grounds for selecting an in-situ alternative not meeting requirements.

Response: The hazards associated with excavating the site were recognized in the FS. It is believed that releases to all media except air, can be readily controlled. Releases to air will be minimized by dust control measures, handling and excavation techniques aimed at minimizing the volume of waste in the open at any given time, and possibly placement of a temporary structure over the waste excavation. Air monitoring will be performed and the potential threat to adjacent residents will be monitored throughout operations as will be the potential need for their immediate evacuation. Threats to workers are real; but this is the reason for extensive safety precautions and health monitoring.

Comment: A risk assesment should have been performed on the Hardage site.

Response: A preliminary Public Health Assessment has been prepared and will be supplemented as further data is obtained.

Comment: The detailed developement and analysis of alternatives presented in the FS is inadequate and may not allow selection of the most appropriate remedy from the four finalists.

Response: Section 300.68(h)(2) of the NCP sets out the factors to be included, as appropriate, in the detailed analysis. These factors are: 1) refinement and specification of alternatives; 2) detailed cost estimate; 3) engineering evaluation of effectivness, implementability, and constructability; 4) assessment of effectiveness of remedy in meeting remedial objectivies; 5) analysis of alternate technologies; 6) analysis of costs of adverse impacts and their mitigation.

These factors were addressed, as appropriate, and alternatives were refined in sufficient detail to allow selection of an appropriate remedy. The development is not to a design level, but it is not intended to be.

Comment: The findings of fact and conclusions of law arrived in 1982 by the U.S. District Court in Oklahoma City concerning the site should not have been relied upon to develope a remedy.

Response: The findings and conclusions were not used in the FS in the manner that the commenter suggested was the case. The facts which led to development of these findings and conclusions have for the most part been supported by data obtained since 1982, and have therefore been properly considered, along with other relevant investigative and factual information concerning the site. EPA did not mean to imply that these findings and conclusions had to be taken at face value, as they certainly were not during the FS but were re-examined as appropriate.

E) OPPORTUNITY FOR PUBLIC PARTICIPATION

Comments were received which indicate some parties feel EPA should have made a greater effort to involve those parties potentially liable for the site in development of the FS and should have allowed more extensive comments on the FS. The NCP as well as current EPA policy is cited as support for this argument.

Where appropriate, EPA will generally involve PRPs in studies and development of response actions. The reasons for this are numerous, not the least of which is the previous experience of the Agency which suggests that those parties most directly involved in studies and most familiar with the rationale for EPA decisions will be most willing to participate in voluntary clean up. At the Hardage/Criner site, the enforcement policy documents which recommend PRP participation in the RI/FS were appropriate, had not been promulgated by EPA at the time the FS was committed. In addition, a PRP search had not yet been completed. For this reason, PRPs were not involved from the outset. In December 1984, an initial group of nearly 300 PRPs was notified of their potential liability on the site. Since that time, approximately 135 parties have formed the Hardage Steering Committee (HSC).

EPA has met with HSC often since its formation. Final documents have been provided in a timely manner; and over 200 requests for documents and information have been answered in writing under the Freedom of Information Act since early 1985. Communication has been frequent between both the technical and legal staffs and have been as open as the enforcement nature of the site allows.

Comment: EPA refused to afford HSC the opportunity to participate in development of the RI/FS. These actions violated EPAs own guidelines including the March 20, 1984 memo from Lee Thoms, "Participation of PRPs in development of RI/FS under CERCLA and the draft CERCLA Settlement Policy".

Response: The March 20, 1984 memo indicates that PRPs may be allowed, to where appropriate, to conduct the RI/FS under an EPA approved scope of work and under a formalized agreement such as a Consent Decree. This policy in no way requires or indicates that EPA will abandon on-going studies merely to allow PRP conduct of an RI/FS. Regional experience has been that when conduct of an RI/FS has been switched from one EPA contractor to another, significant delays result. Even greater delays would be expected in transfer of the RI/FS to a party out-side the Agency. In addition, previous activities of HSC have not indicated that an FS could have been completed by them more rapidly than by EPA. The Hardage Steering Committee had not been organized at the time the FS was initiated in January 1984; aside from this purley practical reason for not allowing HSC to conduct an RI/FS, other factors enter into this situation.

The draft "CERCLA Settlement Policy" referenced to in the comment was issued October 4, 1985, and does not constitute EPA policy. Instead, EPA's settlement policy is contained in the Interim CERCLA Settlement Policy as set forth in the Federal Register on January 5, 1986. At this time the FS was in its later stages of development.

Comment: Insufficient time was allowed for comment on the FS. The document is extensive and detailed, thus a comment period substantially longer than the minimum three weeks required by the NCP would have been appropriate.

Response: There was a 5 week comment period on the FS; this included a 15 day extension requested by HSC. addition, the FS was placed in repositories and provided to the HSC two weeks before the formal comment period began, providing a total of approximately seven weeks for interested parties to review and comment on the FS. While EPA and its contractor did spend approximately eight months compiling the 200 page FS, all data from which this FS was compiled has been available to the public from the time EPA began the FS in mid-1985.

Comment: EPA must afford the HSC an opportunity to finalize and present its own response plan before selecting a remedy.

Response: EPA has repeatedly been told that HSC is or will be preparing some type of response plan. Unfortunantely this work has never been produced, forcing EPA into the conclusion that such work may not be done even if EPA were to wait. Any response plan submitted to EPA will be considered, as have all proposals, documents, advice, and comments in the past, provided such a plan is received in a timely fashion. EPA guidlines and regulations do not, as the commenter states, require EPA to afford the HSC an opportunity to finalize and present this plan.

F) RECOMMENDATION FOR ADDITIONAL STUDY AND/OR INITIAL REMEDIAL MEASURES

The commenters have proposed a general plan for additional studies which in their opinion, should be conducted prior to selection of a remedy for the site. These studies would supplement EPA work and be aimed at developing a RI/FS for both operable units of the site.

These commenters have also proposed to conduct initial measures aimed at site stabilization. These measures would mainly included:

1) fencing of the entire property,

2) construction of a temporary cap and collection system for surface seeps

3) monitoring of drinking water supplies and construction of alternate water supplies if necessary.

EPA feels that some of the study items suggested by the commenters are appropriate. Some of the additional study items and are being considered by EPA as necessary components of studies for the second operable unit. EPA sees no purpose in rethinking its previous decision to split the site into operable units.

The proposed "removal" actions have also been considered by EPA. An EPA site assessment team was dispatched to the site in June 1986 and, following the teams report, action will be taken as necessary.

G) OTHER COMMENTS

Comment: Has EPA considered incineration and disposal of the entire waste volume at Hardage through underground injection. In this area, formations below 3000 feet often show caverns which take enormous amounts of fluids and cannot be plugged by addition of sealant or bridging materials.

Response: Two problems would be presented by disposing wastes in the fashion suggested: the actual ability to do this and the legal and permitting constraints.

The physical problems with injection would be significant. The volume of waste considered for disposal is roughly 179,000 cubic yards, or 36 million gallons, of soils and sludge. To allow injection, the waste would have to be slurried with water, forming a volume in exess of 100 million gallons of waste slurry. While this volume could theoretically be injected in the space of a few weeks, the enormous volume of solids would likely clog cavities rapidly, requiring construction of several wells over an area significantly larger than the site.

Considering the type of waste found at Hardage, it is unlikely such injection wells would be permitted by EPA or the State of Oklahoma.

Comment: EPA should select the On-site incineration/Off-site Disposal Alternative. This is the only way to achieve a permanent remedy for the Hardage site. Several commentors expressed this sentiment; one felt that the On-site incineration and disposal plan would also be adequate.

Response: EPA favors an on-site disposal plan due to several factors including:

1) the volume of waste present;
2) hazards associated with off-site transport;
3) questionable availability of an off-site disposal facility; and
4) the fact that an off-site plan merely shifts hazards to another location and population.

EPA will give appropriate consideration to the incineration options. The decision will be available for public comment before being finalized as a Record of Decision.

Comment: Incinceration should not be selected since 100% destruction of compounds such as 2,3,7,8 - tetrachlorodibenzo -p-dioxin (TCDD) cannot be achieved. In addition, particulates should be sampled prior to emmission to the air.

Response: 100% destruction of anything can never be achieved. Incinerator testing by EPA in Missouri has in all cases achieved greater than 99.9999% destruction of TCDD and has effectively destroyed even hard to burn compounds such as carbon tetrachloride. EPA sets limits on particulate emissions by incinerators and these solids would be analyzed in test burns and periodically throughout the operations.

Comment: The waste could be disposed as follows:

- seperate water/solids by settling
- dispose the water in an injection well
- heat the solids to dry them
- seal the solids in a plastic/cement "casket" and bury
- dispose the dirt in another manner

This plan is, in some ways, similar to the on-site disposal option. The waste treatment and handling techniques have not yet been finalized. These comments and plans will be considered in the design phase of remedial planning.

Comment: Do provisions exist for indemnifying contractors involved in remedial work on Superfund sites from possible future liability under CERCLA for hazards arising from the site at some time after this work is completed.

Response: Under current law, the contractor cannot be indemnified even for actions carried out at EPAs direction. Provisions for contractor indemnification will likely be in revised CERCLA statutes being developed Congress.

Comment: EPA should have more thoroughly investigated deep bedrock to identify existing contamination and evaluate the potential for contamination in the future. This needs to be done since it is contamination of deeper ground water and transport through that flow regime which has the potential to affect populations not in the immediate vicinity on the site.

Response: One of the key purposes of the Management of Migration RI/FS will be to define the long-term potential for migration along pathways such as the deeper groundwater. Three wells drilled on-site to depths of 200 feet or more showed no contaminants at detectable levels.

IV. REMAINING CONCERNS

After completion of the FS, public comment period, and EPA response to these comments, some concerns will likely remain among those individuals affected by or otherwise concerned with the site. These concerns are thought to be as follows:

1. Action should be taken immediately to help reduce health hazards now present since permanent remedial action may take some time to complete.

2. The public wants the cleanup to be a permanent one.

3. Further studies should be conducted to confirm EPA's decisions on the appropriate extent of remedy.